DOCUMENT RESUME

04266 - [B3324556]

An Evaluation of the Use of the Transfer Income Model (TRIM) to Analyze Welfare Programs. PAD-78-14; B-115369. November 25, 1977. 95 pp. + 3 appendices (12 pp.).

Report to the Congress; by Elmer B. Staats, Comptroller General.

Issue Area: Automatic Data Processing (100); Income Security Programs (1300); Program Evaluation Systems: New Techniques and Standards (2602).
Contact: Program Analysis Div.
Budget Function: Income Security: Public Assistance and Other Income Supplements (604); Miscellaneous: Automatic Data Processing (1001).
Organization Concerned: Department of Health, Education, and Welfare; Department of Housing and Urban Development; Department of the Treasury; Department of Agriculture.
Congressional Relevance: House Committee on Ways and Means; Senate Committee on Finance; Congress.

Conceptual models, simplified representations of issues, are used within Government to perform program and policy analyses of complex issues in such areas as social welfare, food, energy, and transportation. The Transfer Income Model (TRIM) was designed to provide estimates of costs, caseloads, and income distributional effects of existing income tax and means-tested transfer programs, modifications to these programs, and proposed means-tested programs. Findings/Conclusions: Since models are based on simplifications of assumptions, approximations, and judgments, the validity of results can be affected. The number of versions and modifications made it difficult to determine which TRIM version had been used for a particular policy analysis. Assumptions were made in the model to compensate for lack of accuracy, completeness, and currentness of data sources; other assumptions concerned transfer program characteristics that affect estimates. Documentation supporting the model lacked information on test results; there were some errors in the computer code; and the model was difficult to use. Since estimates made by TRIM are subject to uncertainty, the model should only be used to assess relative impacts of changes in welfare programs and as a research tool; it should not be used to provide absolute estimates. Its results should be used cautiously for long-term projections, and when developing absolute estimates, information indicating uncertainty of estimates should be provided. Recommendations: The Secretary of Health, Education, and Welfare should reassess the adequacy of models being used to support welfare policy analysis, including: indentifying and obtaining additional data needed to analyze issues; identifying corrective measures needed to make analytical tools more effective and making necessary improvements; insuring that models are well documented, updated, and reassessed; and performing periodic

studies of alternative types of analytical tools. The Secretary should also develop a plan for identifying and meeting future needs for analytical tools and data to support welfare policy analysis. (Author/HTW)

REPORT TO THE CONGRESS

BY THE COMPTROLLER GENERAL OF THE UNITED STATES

An Evaluation Of The Use Of The Transfer Income Model-- TRIM --To Analyze Welfare Programs

Models are used within the Government to perform program and policy analysis of complex issues in such areas as social welfare, food, energy, and transportation. Models allow analysts and decisionmakers to address issues which are not readily susceptible to other analytical techniques.

Models can be extremely useful, and, in some cases, they are indispensable for dealing with analytical problems. However, before being used, models should be evaluated carefully in order to assure that they are used properly and that any uncertainties in the results are identified.

The Transfer Income Model is used widely throughout the Government to analyze a broad range of welfare programs. GAO's assessment of the model demonstrated how changes in assumptions and modifications to the model affect its results. GAO concludes that the model can be very useful in certain circumscribed areas but should not be used for other types of analysis.

PAD-78-14

NOVEMBER 25, 1977

COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-115369

To the President of the Senate and the
Speaker of the House of Representatives

This report describes the Transfer Income Model, identifies how it is being used within the Federal Government, and evaluates the model.

We found in past reviews that a number of problems related to the development and use of computer-based models exist that affect these models' usefulness to decisionmakers. With the current policy considerations and debate concerning welfare, we felt that it was important to examine the primary analytical tool being used by the Federal Government to analyze welfare reform proposals.

We made our review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), the Accounting and Auditing Act of 1950 (31 U.S.C. 67), and the Legislative Reorganization Act of 1970 as amended by Title VII of the Congressional Budget Act of 1974 (31 U.S.C. 1154).

We are sending copies of this report to the Director, Office of Management and Budget; the Secretary of Health, Education, and Welfare; the Secretary of Commerce; and the heads of the other Government departments and agencies mentioned in this report.

Comptroller General
of the United States

COMPTROLLER GENERAL'S REPORT TO THE CONGRESS

AN EVALUATION OF THE USE OF THE TRANSFER INCOME MODEL--TRIM--TO ANALYZE WELFARE PROGRAMS

D I G E S T

Government policy analysts and decisionmakers, in increasing numbers, have been using conceptual models, often implemented on a computer, to perform program and policy analyses. These models enable the analyst/decisionmaker to deal with complex issues in such areas as social welfare, food, energy, the environment, transportation, and urban planning more effectively than they had done before.

A conceptual model is a simplified representation of an issue that attempts to describe, in detail and usually in analytical terms, the underlying structure of an issue. With such a model, analysts can assess simultaneously the interaction of several elements of an issue in response to specific alternative policy options.

GAO recognizes the need for the development of models to support policy and program analyses. Models allow analysts and decisionmakers to deal with aspects of these issues which are not readily susceptible to analysis with other tools. However, a model is a simplified representation of an issue based on simplifying assumptions, approximations, and judgments, all of which affect the validity, reliability, and accuracy of the model's results.

Obviously there is a need to guard against the temptation to view a model as a magic "black box" which automatically gives truthful and complete answers. The fact that aspects of an issue are examined by computer in minute detail and at electronic speed can give a false air of reality to the results. A policy analyst generally should not use a model's results without an awareness of the assumptions, approximations, and judgments

that went into the model, and the consequent uncertainties in the results. Thus, it is essential that all models be carefully evaluated before use in order to assure that they are used properly and that any uncertainties in the results are identified.

WHAT IS THE TRANSFER INCOME MODEL?

The Transfer Income Model is one of the models used for welfare policy analysis. It was designed to provide estimates of the dollar costs, caseloads, and income distributional effects of

--existing income tax and means-tested transfer programs;

--modifications to these programs; and

--proposed means-tested programs, such as a negative income tax.

The model is being used by the Departments of Health, Education, and Welfare; Agriculture; Treasury; and Housing and Urban Development; the Federal Energy Administration; the Congressional Budget Office; several congressional committees; several States; and others.

These groups are using the model to analyze a number of programs, such as Aid to Families with Dependent Children, Food Stamps, Supplemental Security Income, and Federal Individual Income Tax programs; variations of a housing allowance program; and, negative income tax proposals, such as the Income Supplement Program and the Allowances for Basic Living Expenses Program. It is being used also to support the work of President Carter's Welfare Reform Task Force. (See ch. 3.)

The major component of the model consists of the data bases which contain economic, social, and demographic information on households, families, and individuals. Data bases used by the model include the Current Population Survey, the Decennial Census Public Use Sample, the Survey of Income and Education, and the

Survey of Economic Opportunity. The other components of the model consist of computer programs which modify the data bases, project the data bases to represent a future year, and simulate the various tax and means-tested transfer programs. (See chs. 2 and 4.)

GAO's evaluation of the Transfer Income Model addresses a number of questions, such as:

--What are the major assumptions made in the model?

--What effect do these assumptions have on the model's results?

--Is the model documentation sufficient to understand, use, and maintain the model?

--Is the model usable by policy analysts/ decisionmakers? (See chs. 5 and 6.)

FINDINGS AND CONCLUSIONS

Given the complexity of welfare issues and the pressing need to analyze these issues, modeling is a valuable and, in some cases, a necessary tool. A model is designed to analyze certain aspects of an issue, and the application of the model to other issues should be undertaken only after considering the limitations inherent in the model. In any event, a model should be evaluated carefully, prior to its use. With respect to the Transfer Income Model, GAO noted that:

--A number of versions of the model exist, and each version of the model has been undergoing significant modifications. This makes it difficult to determine which version or what modification of the model has been used by an executive agency for a particular policy analysis. This situation also increases the possibility that agencies using different versions of the model will make different estimates of the costs, impacts, and benefits of the same proposal.

--Because none of the currently available data sources contain all the requisite information for analyzing welfare issues, assumptions are made in the model to compensate for the lack of accuracy, completeness, and currentness of the available data. These assumptions affect the estimates made by the model.

--Other assumptions made in the model concern critical transfer program characteristics, such as determining the categorical eligibility for a transfer program, implementing a transfer program's asset test, and estimating participation in a transfer program. These assumptions also affect the estimates made by the model.

--Documentation supporting the model, although containing most of the information GAO feels is necessary, lacks information on the results of validation and sensitivity tests of the model, and it has not been updated to contain the most recent revisions to the model.

--There are some errors in the computer code which indicated that there was possible inadequate verification of the computer model during its development.

--The model is difficult to use and requires a considerable investment of staff and computer resources to use it effectively.

GAO analysis indicates that estimates made by the Transfer Income Model are subject to considerable uncertainty which raises questions concerning the way the model should be used. Based upon its evaluation, GAO concludes that:

--The model can be used to assess the relative impact or change in the eligible caseloads, associated dollar costs, and the distributional effect of changes in existing welfare programs compared to the existing set of programs.

--Used as a research tool, the model appears to be well-suited to the task of investigating the relative effects of wholesale changes in the welfare system provided that adequate data are available.

--In general, the model should not be used to provide absolute estimates of the eligible or participating caseload, associated dollar costs, and/or income distributional effects of existing or proposed welfare programs, especially if no information is provided as to the uncertainty inherent in the model's estimates.

--The model's results should be used very cautiously for long-term projections (i.e., estimates beyond 4 or 5 years).

Analysts and decisionmakers often need absolute, not just relative, estimates of the impact of proposed program changes. Despite its limitations when used to develop absolute estimates, it may be necessary to use the Transfer Income Model for this purpose because there are no better alternatives. However, when considering its use for this purpose, it should be noted that Transfer Income Model estimates are not accompanied by any information that indicates the uncertainty inherent in these estimates. Such information should be routinely provided and is particularly vital when the model is used for making absolute estimates.

RECOMMENDATIONS

GAO recommends the Secretary of Health, Education, and Welfare:

--Reassess the adequacy of models and other analytical tools, including data bases, currently being used to support welfare policy analysis. This should include

  --identifying the additional data needed to analyze welfare issues and obtaining this information on a consistent and continuing basis;

--identifying corrective measures needed to make the current analytical tools more effective and making necessary improvements;

--insuring that models in use are well documented, updated on a regular basis, and continually reassessed as to the reliability and usefulness of their results; and

--on a periodic basis, performing a comprehensive study of the strengths and weaknesses of alternative types of welfare policy analytical tools, including a cost-effectiveness analysis, if possible.

--Develop a plan for identifying and meeting future needs for analytical tools and data to support welfare policy analysis.

Analyses of alternative policies and programs are placing an increasing reliance on the use of computer models and large data bases. Because of the generally increasing use of models to provide supporting data for these analyses and their close link to survey data, GAO recommends the Secretary of Commerce refine and extend the forthcoming Statistical Policy Handbook to specifically include guidelines for presenting results obtained through the use of such computer models.

AGENCY COMMENTS

The Department of Health, Education, and Welfare and the private organizations contracted to develop the model were given the opportunity to review and comment on this report. The Department of Health, Education, and Welfare and one contractor, Mathematica Policy Research, Inc., took exception to the conclusion that the model should not be used for budget estimating purposes. They pointed out that presently there are no better alternatives for making these estimates. Also the Department did not concur with the recommendation that its analytical tools should be reassessed periodically from a cost-effectiveness (cost-benefit) viewpoint. The other contractor, the Urban Institute, was in general agreement with the content of the report. (See pp. 94 and 95, and app. I.)

Contents

		Page
DIGEST		i
CHAPTER		
1	INTRODUCTION	1
	It is important to evaluate models	1
	How we chose to evaluate the Transfer Income Model (TRIM)	2
	Scope of review	3
2	OVERVIEW OF THE TRANSFER INCOME MODEL	5
	TRIM processes data on households and individuals	6
	How TRIM determines benefits	6
	The structure of TRIM	9
	How information is processed by TRIM	10
	A simplified Food Stamp program example	10
3	HOW THE TRANSFER INCOME MODEL IS BEING USED IN GOVERNMENT	13
	Department of Health, Education, and Welfare	15
	Office of the Assistant Secretary for Planning and Evaluation	15
	Social and Rehabilitation Service	16
	Department of Agriculture	17
	Department of the Treasury	17
	Department of Housing and Urban Development	18
	Federal Energy Administration	20
	Congressional Budget Office	21
	Other congressional users	22
	Use of TRIM by State governments	22
4	TECHNICAL DESCRIPTION OF THE TRANSFER INCOME MODEL	25
	TRIM data bases	25
	Current Population Survey	27
	Survey of Economic Opportunity	29
	The 1970 Decennial Census Public Use Sample	29
	Survey of Income and Education	30
	Income underreporting	31
	Preparing the data base	31
	Modifying the base year data	33

CHAPTER		Page
	Projecting the data base to represent a future year	34
	Demographic aging	36
	Economic aging	38
	Adjusting the unemployment rate of the data base	40
	Simulating tax programs	40
	The Federal Individual Income Tax Program	41
	Payroll tax program	42
	Simulating Public Assistance programs	43
	Supplemental Security Income program	43
	Aid to Families with Dependent Children program	43
	General Assistance program	44
	How the public assistance module works	44
	Factors which complicate the public assistance simulation	45
	Output of the public assistance simulation	48
	Simulating the Food Stamp program	49
	How the Food Stamp module works	49
	Factors which complicate the Food Stamp simulation	50
	Other features	53
5	OUR CRITERIA FOR EVALUATING TRIM	55
	Model documentation	56
	Computer program verification	58
	Technical validity	58
	Operational validity	59
	Dynamic validity	59
	Usability	59
	Other considerations	59
6	OUR EVALUATION OF THE TRANSFER INCOME MODEL	61
	The accuracy or reliability of TRIM is difficult to determine	61
	The data affect TRIM's estimates	62
	How the data situation affects TRIM	63
	The effect of income underreporting on TRIM estimates	64
	Alternative procedures used to determine the appropriate tax and transfer program filing units produce significantly different estimates	65

CHAPTER		Page
	Aging the data base affects TRIM estimates	68
	How the aging process affects the data base	69
	How the aging process affects the tax and transfer program estimates	72
	Different assumptions are made to simulate the asset test for each transfer program	74
	Problem in simulating participation in other transfer programs	78
	Other considerations	80
	Dynamic validity	82
	TRIM documentation	83
	Computer program verification	84
	Usability of the Transfer Income Model	85
	TRIM is difficult to use	85
	The costs to develop and use TRIM are substantial	87
	TRIM's transferability to other computers	88
7	CONCLUSIONS, RECOMMENDATIONS, AND AGENCY/CONTRACTOR COMMENTS	90
	Recommendations	93
	Agency comments	94
APPENDIX		
I	Agency/contractor comments	96
II	List of related GAO reports	106
III	Principal HEW officials responsible for administering activities discussed in this report	107

ABBREVIATIONS

AFDC	Aid to Families with Dependent Children
AGI	Adjusted Gross Income
CBO	Congressional Budget Office
CHRDS	Comprehensive Human Resources Data System
CPS	Current Population Survey
CPUS	Census Public Use Sample
FEA	Federal Energy Administration
FICA	Federal Insurance Compensation Act
FNS	Food and Nutrition Service
GAO	General Accounting Office
HEW	Department of Health, Education, and Welfare
H.I.S.	Committee on House Administration, House Information Systems
HUD	Department of Housing and Urban Development
IBM	International Business Machines
MATH	Microanalysis of Transfers to Households Model
OASPE	Office of the Assistant Secretary for Planning and Evaluations
SEO	Survey of Economic Opportunity
SIE	Survey of Income and Education
SMSA	standard metropolitan statistical area
SOI	Statistics of Income
SSI	Supplemental Security Income Program
TRIM	Transfer Income Model

CHAPTER 1

INTRODUCTION

The issues facing Government decisionmakers in the areas of social welfare, food, energy, the environment, transportation, urban planning, and other areas are extremely complex. In order to deal effectively with these complex issues, Government policy analysts and decisionmakers, in increasing numbers, have been using conceptual models of these issues (often implemented on a computer) to perform program and policy analyses. A conceptual model is a simplified representation of an issue that attempts to describe, in detail and usually in analytical terms, the underlying structure of the issue. With such a model, a policy analyst can assess simultaneously the interactions of several elements of an issue in response to a specific alternative policy option.

We recognize the need for the development of models to support policy and program analysis. These models allow Government policy analysts and decisionmakers to deal with aspects of these issues which are not readily susceptible to other analytical tools. Of course, modeling is not the only technique available for studying complex situations. Other methods which have been and are being used range from "back-of-the-envelope" estimates, to soliciting expert opinion, to social experimentation. This latter method is exemplified by the New Jersey Income Maintenance Experiments in which a negative income tax proposal was actually implemented in the controlled environment to determine if and how it would work. Each of these methods has its role in policy analysis. However, due to the speed with which a model, when implemented on a computer, can provide estimates of the effects of several alternative proposals, it may be the only feasible way to thoroughly analyze a complex issue or system.

Modeling also affords other advantages. The process of building a model requires structuring the system or issues--identifying many relationships and making assumptions. This process in itself, can improve one's understanding of the system or issue. At the least the process will result in documenting the model's structure of the system, and can serve as a basis for communication among those analyzing the system.

IT IS IMPORTANT TO EVALUATE MODELS

It cannot be overlooked that a model is a simplified representation of an issue--based on simplifying assumptions,

approximations, and judgments--which naturally affects the validity, reliability, and accuracy of the model's results. Obviously there is a need to guard against the temptation to view a model as a magic "black box" which automatically gives truthful and complete answers. The fact that, by implementing a model on the computer, aspects of an issue are examined in minute detail and at electronic speed can give a false air of reality to the results. A prospective policy analyst/decisionmaker may use a model's results while not being fully aware of the assumptions, approximations, and judgments that went into the model, and how they affect these results. Thus, while we feel that the use of such models is essential for policy analysis, it is just as essential to have an independent evaluation of their capabilities to establish the appropriate level of confidence in their results.

HOW WE CHOSE TO EVALUATE THE TRANSFER INCOME MODEL (TRIM)

We reviewed and evaluated one of the models used for welfare policy analysis. The welfare area is an excellent example of a complex issue requiring thorough analysis. Over the past several decades the Federal Government has undertaken and expanded a wide range of income security programs. The overall objective of these programs is to generate adequate levels of income for all Americans to meet basic consumption needs. These programs range from the social insurance programs, such as Social Security, Medicare, and unemployment insurance, to the means-tested programs--that is, programs for which eligibility is determined in part by testing or examining a family's resources--which are normally referred to as welfare programs. These welfare programs, which provide cash or in-kind benefits primarily to low income families, include the Aid to Families with Dependent Children (AFDC), Food Stamp, Medicaid, and Supplemental Security Income (SSI) programs.

Both the number of welfare recipients and program costs have risen considerably over the past few years. For example, AFDC rolls have more than doubled and that program's costs have increased fivefold in the past 10 years. Benefits, regulations, and eligibility vary from program to program and from State to State. Responsibility for some programs is split between Federal and State (and sometimes local) governments. Critics, both in and out of Government, are concerned that the current welfare system appears to be unorganized, inequitable, and too costly. Moreover, they believe the system has caused undesirable effects, such as discouraging

work, disrupting families, and encouraging migration to higher benefit welfare areas.

These growth, structure, equity, and effects issues have been the topic of many debates and have provoked numerous reform proposals. These proposals generally suggest either reforming a specific program or programs, such as AFDC or Food Stamp, or significantly altering the structure and relationship of the current programs, exemplified by the negative income tax type of reform proposal.

The complex interrelationships of these welfare programs coupled with their interaction with the other income security programs, Federal tax policies, employment and wage policies, etc., make the task of welfare reform extremely difficult.

The model we evalutated--TRIM--was selected because of its widespread use throughout the government to analyze a broad range of welfare programs. For example, TRIM has been used to analyze AFDC, SSI, Food Stamp, and Federal Individual Income Tax programs; modifications to these programs; variations of a housing allowance program; and negative income tax proposals, such as the Income Supplement Program and the Allowances for Basic Living Expenses Program. TRIM is being used currently to support the work of President Carter's Welfare Reform Task Force.

SCOPE OF REVIEW

The purpose of our review was threefold, to

--develop a nontechnical description of TRIM for use by congressional and Federal agency decisionmakers (see chs. 2 and 4),

--identify how TRIM is being used in the Government (see ch. 3), and

--evaluate TRIM (see chs. 5 and 6).

We conducted our review from our headquarters, Washington, D.C., during June 1976 to April 1977 and interviewed Federal Government users of TRIM at the Departments of Health, Education, and Welfare (HEW), Housing and Urban Development (HUD), the Treasury, and Agriculture, the Federal Energy Administration, the Congressional Budget Office (CBO), and the Committee on House Administration, House Information Systems (H.I.S.). We also interviewed personnel from State governments using TRIM and the primary TRIM contractors, the Urban Institute and Mathematica Policy Research, Inc.

Our effort relied heavily on

--the above interviews,

--available documentation of TRIM,

--Federal agencies' reports containing TRIM supported analysis, and

--test runs of TRIM we conducted with the support of H.I.S.

The latter point deserves additional attention. The description of TRIM contained in chapter 4 is a description of the H.I.S. version of TRIM. At one time, it was thought that a version of TRIM maintained at HEW would be the standard version of TRIM for all to use. 1/ However, most TRIM users have modified either the model or its data base before using the system (see ch. 3). Moreover, recent TRIM-related developmental work has resulted in the Microanalysis of Transfers to Households (MATH) model. Although the MATH model contains a number of enhancements to the existing TRIM features, in this report we are considering MATH as another version of TRIM.

1/This version of TRIM is referred to as TRIM Ver-1.

CHAPTER 2

OVERVIEW OF THE TRANSFER INCOME MODEL

The Transfer Income Model is a computer model used to analyze income tax and means-tested transfer programs. "Means-tested" refers to the fact that eligibility for the program is determined in part by examining a family's "means" or resources. When considering a revision to an existing transfer program (e.g., Aid to Families with Dependent Children), considering a new program, or proposing a complete revision of the entire welfare system, the policymaker, either in the Congress or the agencies, is interested in estimates of:

--What the program will cost.

--Who will be affected.

--How they will be affected.

TRIM is an analytical tool designed to provide estimates of the dollar costs, caseloads, and income distributional effects of

--existing income tax and means-tested transfer programs,

--modifications to these programs, and

--proposed means-tested programs such as negative income tax proposals.

TRIM represents a complete restructure of the Reform in Income Maintenance model developed in 1968 for the President's Commission on Income Maintenance. After 1968 the model was revised and used to analyze various versions of the Family Assistance Plan, a welfare reform measure proposed by the Nixon administration. However, the model was too cumbersome to use because of the ad hoc manner in which it was developed. Moreover, it became increasingly difficult for those using the results to understand how the model actually worked. As a result, the model was abandoned and development of TRIM was started. Since 1972 TRIM has been extensively revised. In addition, as the number of governmental users has increased over the past few years the number of versions of TRIM has increased likewise. (See ch. 3.)

TRIM PROCESSES DATA ON HOUSEHOLDS AND INDIVIDUALS

TRIM's approach to analyzing the welfare area starts with the individual decisionmaking units (i.e., households, families, or individuals) rather than some relatively larger units (e.g., State, region, or nation). That is, data used as input to TRIM contain detailed income and employment information on households, families, and individuals rather than aggregate income and employment information on the State, regional, or national level. This technique or modeling approach is called microsimulation.

Of course, it would not be practical to use TRIM if a TRIM simulation required detailed data on every household and individual in the total U.S. population. It would take days rather than minutes for TRIM to simulate a welfare program alternative if this were the case. The ability to use TRIM obviously depends on the availability of data on a sample of households and individuals obtained from a carefully conducted survey to insure the data adequately represent the total U.S. population. An appropriate survey is, for example, the Bureau of Census Current Population Survey (CPS).

The TRIM/microsimulation approach is able to make cost and caseload estimates at the national level based on this survey data because each household and individual surveyed is assigned a "weight" which corresponds to the household's or individual's representativeness in the U.S. population. For example, if a weight of 1,600 were assigned to a particular household, this would indicate that there are 1,600 households in the U.S. population with the same demographic/economic characteristics as the surveyed household.

HOW TRIM DETERMINES BENEFITS

While TRIM is a large and complex model consisting of about 60,000 lines of programming instructions, it is not difficult conceptually to follow the flow of information through TRIM. Certain steps or procedures are common to determine eligibility and benefits/taxes for most means-tested programs. TRIM through its programmed instructions executes the steps as would a caseworker in a public welfare department or a tax consultant in preparing an income tax return. However, TRIM executes these steps for each household and individual record in the data base and for each income tax and transfer program being analyzed. These steps determine

--the household's and individual's filing status and categorical eligibility for each program,

--their economic eligibility for each program, and

--the benefits or tax liability of each eligible household or individual.

Filing status refers to the types of filing units the tax or transfer program considers. For example, the filing unit for the Food Stamp program is the household; the AFDC program deals with families with children; the SSI program is concerned with individuals; and the Federal tax program differentiates between individuals and families and joint returns or separate returns.

Categorical and economic eligibility refer to the noneconomic and economic criteria which a filing unit must satisfy in order to qualify for the tax and transfer programs. The noneconomic criteria generally specify the target group of a program (i.e., the target group for the SSI program is the aged, blind, and disabled). The economic criteria specify the types and amounts of various sources of income and assets which are countable as the economic resources for a given program, as well as various allowable exclusions and deductions. Determining economic eligibility requires comparing the unit's economic resources with the program's economic criteria to establish whether these resources are within the limits prescribed by the particular program. For the Federal tax program, this is analogous to determining first adjusted gross income and then subtracting exemptions and deductions to calculate taxable income.

Once categorical and economic eligibility is established, the program benefit or tax can be calculated. For example, for the Food Stamp program this requires identifying the proper coupon allotment (a function of family size) and the purchase requirement 1/ (a function of countable income) from a table of benefits. For the tax program this requires checking the proper tax table (a function of filing status) for the tax associated with the previously determined countable income (i.e., taxable income).

1/Recent legislation (Public Law 95-113, the Food and Agriculture Act of 1977) eliminated the purchase requirement and made other substantive changes to the Food Stamp program. The above description pertains to the program prior to this legislation.

Why, then, is TRIM so large and complex? Among the many factors influencing this complexity are:

--The data bases currently available for use by TRIM, although probably the best microdata bases available, were not developed for TRIM. Consequently, the data bases do not have their information carried in the proper TRIM format nor do they contain all the information TRIM requires. As a result a significant portion of TRIM is devoted to modifying the data base so as to provide the necessary information.

--Most program analyses are concerned with current and future year costs and effects. However, all TRIM data bases are current, at best, to the previous year (i.e., the March 1975 CPS was the most current TRIM data base, as of February 1977). Consequently, TRIM must have the capability to project or "age" the data base to a future year.

--TRIM can examine a number of tax or transfer programs and alternatives, at the same time, thus addressing the interrelationships of these programs. This requires detailed computer instructions for each program as well as an enormous amount of recordkeeping.

Up to this point we have briefly described the purpose of TRI and some of its capabilities. The following section describes how TRIM is structured and concludes with a simplified example of a TRIM analysis.

THE STRUCTURE OF TRIM

For the purpose of this report, we have divided TRIM into the following components, the

--TRIM data bases,

--TRIM module 1/ that modifies the TRIM data bases,

--TRIM module that ages (i.e., projects to a future year) the data bases demographically and economically and adjusts the data base for different unemployment levels, and

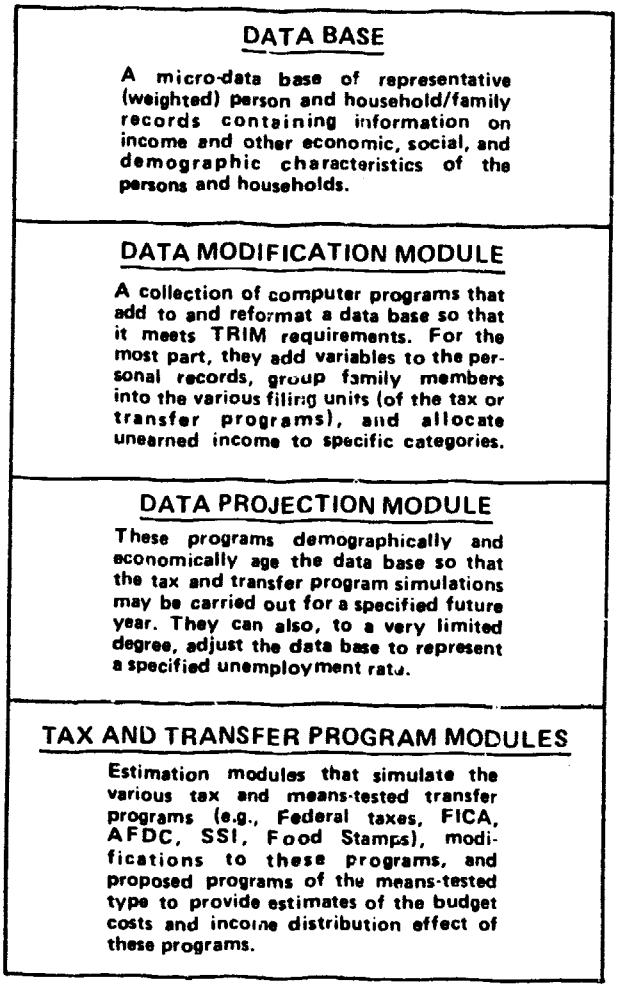
---

1/We are defining a module to be a computer program or collection of computer programs that are functionally related.

--TRIM modules that simulate the income tax and transfer programs and reports the results.

These components are highlighted in figure 1 and are described more thoroughly in chapter 4. Regardless of the version of TRIM being used, the basic components will still exist; however, the specific items in any given module may vary. Moreover, only those specific data and computer programs needed for a particular TRIM simulation are used during any individual simulation. This modularity allows new or additional features to be added to one module without necessarily increasing the complexity of the other TRIM components. This aspect will become more clear after describing the data processing flow within TRIM.

FIGURE 1. BASIC COMPONENTS OF TRIM



How information is processed by TRIM

Figure 2 provides a simplified flow chart of TRIM. The figure highlights the modularity of TRIM and shows that some TRIM basic components can be bypassed depending upon the requirements of a particular simulation. The user, through the user parameter cards (top of figure 2), selects the specific computer programs and/or TRIM options to be executed at each data processing point and the value of certain required input data. This process and data flow is explained next by means of a simplified example which also illustrates the modularity of TRIM. Detailed knowledge of the TRIM modules is not necessary to follow the example.

A SIMPLIFIED FOOD STAMP PROGRAM EXAMPLE

Suppose that a policy analyst at the Food and Nutrition Service, U.S. Department of Agriculture, wants to analyze the effect on Food Stamp costs and caseloads, for 1977 and 1980, of having a mandatory standard deduction from countable income rather than using the existing itemized deductions for child care, work-related, hardship, and other expenses. 1/ Suppose also, that the most current TRIM compatible data base available is the March 1975 Current Population Survey which had never been used on TRIM. To perform this simulation using TRIM, the analyst would input parameter cards which indicate the selection of the following, the

--March 1975 CPS data base;

--data modificiation module since the data base had never been used by TRIM;

--data projection module to initially age data base to 1977;

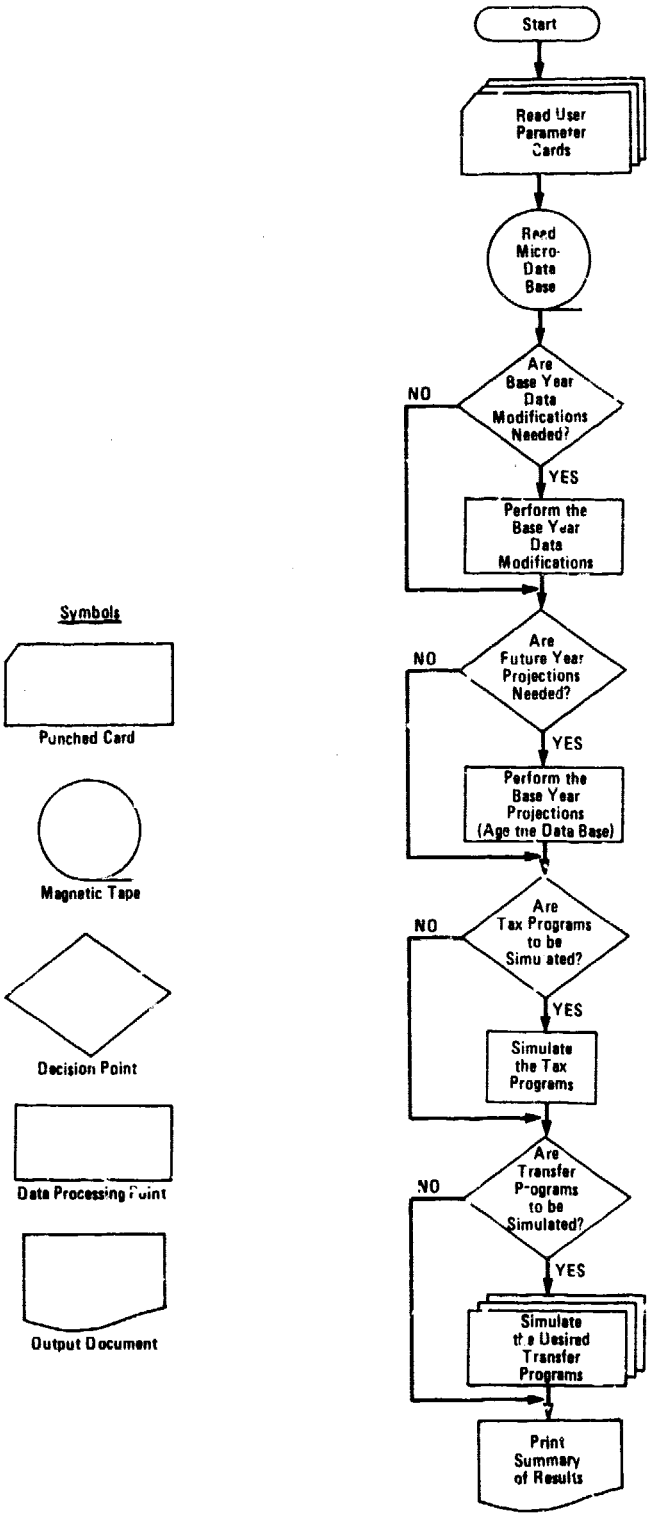
--tax module since taxes are subtracted from income before determining Food Stamp eligibility;

--public assistance module which simulates the SSI, AFDC, and State general assistance programs since households in which all members receive public assistance are automatically eligible for Food Stamps; and

---

1/Recent legislation (Public Law 95-113, the Food and Agriculture Act of 1977) eliminated certain of these itemized deductions.

FIGURE 2
SIMPLIFIED FLOWCHART OF TRIM



--Food Stamp module would be requested twice--first using the existing rules of the Food Stamp program and the second time assuming a standard deduction.

Also a considerable amount of data specific to these programs would have to be input. In order to analyze 1980, the first two steps would not have to be repeated. However, the data base would have to be aged to 1980 and the execution of the tax and transfer program modules would have to be repeated.

CHAPTER 3

HOW THE TRANSFER INCOME MODEL IS BEING USED IN GOVERNMENT

As we have already observed, the Transfer Income Model has become a widely used analytical tool in the Federal Government. TRIM has been used by some State governments also. The purpose of this chapter is to provide a brief survey of this usage.

Until recently, HEW was the primary user of TRIM. The number of Federal users has increased in the past 2 or 3 years and now also includes the Departments of Agriculture; the Treasury; and Housing and Urban Development; the Federal Energy Administration; the Congressional Budget Office, several congressional committees, and others.

The increased number of governmental users and the subsequent increase in the types of income tax and transfer programs modeled in TRIM has necessitated modifications and extensions to the original TRIM. In general, each user has modified assumptions, developed additional modules, and/or has modified one of the data bases to adapt TRIM to the user's own special requirements (see fig. 3). One consequence of these frequently ad hoc modifications is that different, inconsistent estimates of the same proposals have resulted, depending upon which version of TRIM is used.

In 1975, a TRIM Users' Group was established to insure some regular communication among the model's users. All of the Federal agencies mentioned above are members of the TRIM Users' Group. The group supports a contract for the continued maintenance of TRIM. This maintenance attempts to insure, for example, that changes in the parameters of programs modeled by TRIM (e.g., an SSI benefit increase due to a cost of living adjustment or a change in a program due to new legislation) are accounted for in TRIM (and its supporting documentation), and that the most currently available March Current Population Survey data base is available to all TRIM users.

The following sections describe the specific applications of TRIM by the governmental users. These sections focus attention on the following important points, the

--uses being made of the model by the organization and

FIGURE 3. SUMMARY OF TRIM VERSIONS (note a)

TRIM COMPONENT / AGENCY	DATA BASE	DATA MODIFICATION	DATA PROJECTION	INCOME TAX AND TRANSFER PROGRAMS
HEW OASPE	The March Current Population Survey	[b]The TRIM Ver-1 data modification procedures	The TRIM Ver-1 aging options plus their own internally developed aging procedures	The TRIM Ver-1 Federal taxes module plus their own variation to it; the TRIM Ver-1 public assistance, SSI and Food Stamps modules. A negative income tax module; and the TRIM Ver-1 Generalized Income Maintenance Simulation (IMSIM) module
HEW SRS	The 1970 Census Public Use Sample merged with the 1973 AFDC survey data	[c]The MATH data modification procedures	The TRIM aging options plus the MATH semi dynamic aging procedure for shifts in family composition	The MATH tax and transfer program modules for Federal taxes, Public Assistance (Includes AFDC)
HUD	The 1970 Census Public Use Sample	The TRIM Ver-1 modification procedures	The TRIM Ver-1 aging options	The TRIM Ver-1 modules plus Housing Allowance Module
USDA	The March Current Population Survey	The MATH data modification procedures	The MATH aging options	The MATH modules for all the tax and transfer programs
FEA	The 1970 Census Public Use Sample	The MATH data modification procedures	A variation of one of the TRIM Ver-1 demographic aging options plus the TRIM Ver-1 economic aging options	The MATH modules for all the tax and transfer programs
TREASURY	The March Current Population Survey and soon the March CPS with SOI data	The MATH data modification procedures	The MATH aging options	The Treasury's own Federal taxes module plus the MATH transfer program modules
CBO	The March Current Population Survey	The MATH data modification procedures	One of the MATH aging options	The MATH modules for all tax and transfer programs
H.I.S. (note d)	The March Current Population Survey	Data bases modified by the MATH and TRIM Ver-1 data modification procedures have been used	The TRIM Ver-1 aging options and the MATH aging option used by CBO	The HEW Federal Taxes Module, the MATH Public Assistance and Food Stamps Module, the TRIM Ver-1 IMSIM module

[a]This summary indicates the TRIM modules used by these agencies to perform the analyses described in this chapter.
[b]TRIM Ver-1 is maintained by HEW/OASPE.
[c]MATH is a recently developed verison of TRIM. The modification procedures differ in their handling of public assistance filing units. (See chap. 5.)
[d]The H.I.S. version is described in chap. 4.

--modifications the organization has made to the model.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

HEW has been involved with TRIM longer than any other current governmental user and represents the focal point for the use of TRIM in the Federal Government. The principal users of TRIM in HEW are the Office of the Assistant Secretary for Planning and Evaluation and the Social and Rehabilitation Service. 1/ HEW was instrumental in organizing the TRIM Users' Group and provides most of the funding for the maintenance of the system.

Office of the Assistant Secretary for Planning and Evaluation

The Office of the Assistant Secretary for Planning and Evaluation (OASPE) has used TRIM for the estimation of costs and caseloads of alternative negative income tax programs such as the Income Supplement Program. 2/

For many of its analyses, OASPE uses some internally developed procedures for aging the CPS data base. They also have several variations of the Federal income tax module which they use in addition to a negative income tax computer program. Generally speaking, these features are not part of TRIM Ver-1 although HEW did state that the features could be incorporated into the system if sufficient interest were displayed by the user community. OASPE has installed TRIM on its computer system and has a small staff assigned the responsibility of operating the model for their analysis efforts. OASPE intends to prepare a detailed plan for improvements, changes, and/or additions to TRIM so that it better meets their specific needs.

1/Due to a recent reorganization, the Service has been dissolved and its functions split between three HEW agencies--the Social Security Administration (for AFDC), the Health Care Finance Administration (for Medicaid), and the Office of Human Development (for Social Services). The staff within the Service who used TRIM are now assigned to the Office of Research and Statistics, Social Security Administration. We shall continue to refer to the Service in this report, as it was the agency which used TRIM in the time frame covered by this report.

2/See Income Supplement Program, 1974 HEW Welfare Replacement Proposal, HEW Technical Analysis Paper No. 11, October 1976.

Social and Rehabilitation Service

Social and Rehabilitation Service has used TRIM to:

--Analyze the impact of inflation and unemployment on the costs and caseloads of the Aid to Families with Dependent Children program.

--Forecast costs and caseloads of the AFDC program over a 5-year planning horizon for input to the HEW budget process. 1/

The Social and Rehabilitation Service also plans to use TRIM to analyze alternative designs of the AFDC program (i.e., alter various program criteria and note the effect on costs and caseloads) and to forecast State-by-State AFDC program costs and caseloads.

Considerable model development and data base modification work has been required to support the Social and Rehabilitation Service analyses. All of this developmental work has been done under contract and is included in the MATH version of TRIM. This work includes

--modifications to the TRIM public assistance module (which simulates AFDC),

--development of a labor supply response module, and

--development of additional computer programs for the data projection module to dynamically simulate changes in family composition (e.g., birth, marriage) necessary to study the issue of AFDC eligiblity. 2/

These changes are part of the MATH version of TRIM. The modified TRIM public assistance module is now part of the P.I.S. version of TRIM and is described in chapter 4.

1/Hollenback, K. (Mathematica Policy Research, Inc.), An Analysis of the Impact of Unemployment and Inflation on AFDC Costs and Caseloads, Feb. 13, 1976.

2/The Social and Rehabilitation Service calls the computer model that results from all this development work the Microsimulation Welfare Model especially when performing State-by-State analyses. For our purposes this work is all TRIM-related development and no distinction between the model and TRIM seems warranted. In fact, the version of TRIM being used for this analysis is actually MATH.

The Social and Rehabilitation Service is interested in State, as well as national, estimates of the AFDC program. While the Current Population Survey is adequate for national analyses, it is not statistically representative for AFDC estimates at the State level.

Hence, some work had to be done to develop a data base which would permit appropriate inferences at the State level. Under contract, the Social Rehabilitation Service had a stratified subsample of the 1970 Public Use Sample (from 1970 Decennial Census) aged to 1973 and statistically matched with data from the 1973 Survey of AFDC Recipients (this survey is conducted biannually). The 1970 Public Use Sample is acknowledged to be statistically representative for State analyses and consequently provided a data base which contained both detailed information on participants in the AFDC program as well as information on the nonparticipant population for the program. This permitted State-by-State analyses.

The Social and Rehabilitation Service is currently funding development of a new TRIM module to simulate the Medicaid program.

DEPARTMENT OF AGRICULTURE

The Food and Nutrition Service (FNS), Department of Agriculture, has used TRIM extensively over the past 2 years and plans to continue using it. Their use has been primarily in connection with the analysis of Food Stamp program reform alternatives originating from (1) within FNS, (2) elsewhere in the, administration, and (3) the Congress. More than 200 alternatives have been tested using TRIM.

To perform these analyses, FNS contracted to have a Food Stamp module developed for TRIM. The development of the Food Stamp module added additional capabilities to TRIM beyond extending TRIM to simulate the Food Stamp program. Since households in which all individuals participate in a public assistance program are automatically eligible for Food Stamps, TRIM needed to be modified so that it could simulate participation in the public assistance program. Heretofore, the model only simulated eligibility for a public assistance program. This Food Stamp module is part of the H.I.S. version of TRIM and is described in chapter 4.

DEPARTMENT OF THE TREASURY

The Office of Tax Analysis, Department of the Treasury, uses TRIM to analyze the effect of various tax policy proposals on the population. The model has been used to forecast the impact of proposed policies to broaden the tax base

and reduce tax rates, and also to examine the impact of the 1975 tax law and various tax credits.

Treasury also utilizes its large Personal Individual Income Tax Model for analyses; but it is dependent on a data base of tax filers which precludes its use in those cases where the proposed tax policy affects nonfilers (many elderly and low income families). Since most of the TRIM data bases represent the total population, TRIM does not have the above limitation.

Over the past year, Treasury has been reprogramming (converting) TRIM for use on its UNIVAC 1108 computer system. This has been a formidable task since previously TRIM has only been used on International Business Machines (IBM) computers. During this process, Treasury has made extensive modifications to the TRIM Individual Income Tax module to

--make the module more flexible by providing the user more options, giving it the ability to simulate a variety of Federal tax plans as well as State taxes for many States and

--update the module for the 1975 Tax Law.

This module is not a part of the TRIM Ver-1 or the H.I.S. version of TRIM and will have to be reprogrammed if anyone intends to use it on an IBM computer. Some documentation on the new module has been provided to TRIM users.

In a related effort the Department of Treasury has done considerable work aimed at improving the Current Population Survey data base. The effort involves merging the CPS data base with Statistics of Income (SOI) data developed from Internal Revenue Service files, in order to incorporate the more accurate income information of the SOI data base into the more representative CPS data base. Later this year Treasury intends to similarly merge the 1976 Survey of Income and Education with SOI data. When this developmental effort is completed, Treasury intends to make the data base available to other TRIM users.

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

The Division of Housing Research, HUD, has used TRIM, under contract, as a subtask of one element of the Experimental Housing Allowance Program. For this effort, a Housing Allowance Module was developed so that TRIM could estimate costs and benefit patterns of a national housing allowance program, and forecast the consequences of changing certain key program

elements of a national housing allowance design. The module is not part of the TRIM Ver-1, MATH, or H.I.S. versions of TRIM and thus is not contained in our TRIM description in chapter 4. However, a brief description of the capabilities of the module is included below. 1/

Specifically, this module of TRIM has been used to estimate the differences in coverage and cost of three different housing allowance programs: the Housing Gap Program Center, the Rent-Conditioned Housing Gap Program Center, and the Gross Income Reference Group Program Center. The three programs utilize two different payment formulas, two different concepts of program-defined income, and two different concepts of payment standards. In each case, the TRIM simulations focused on three areas of concern:

--The demographic composition of the eligible population.

--The condition of housing occupied by households at the inception of the program.

--Household participation in other income-conditioned programs.

In employing TRIM for these purposes some results from the ongoing housing allowance experiments have been used to specify certain of the assumptions, particularly with respect to expected rates of participation in a national housing allowance program.

The data base used for this work was the 1970 Census Public Use Sample (CPUS). The CPUS was chosen because it was more current than the Survey of Economic Opportunity and broader in data coverage than the CPS. However, it was necessary to develop information on such variables as mortgage debt and equity for owner-occupants and "housing costs" for homeowners which are equivalent to rent. These variables were imputed 2/ to each household record. Various other assumptions peculiar to housing programs were also made.

1/See also, Variations of Selective Design Elements for Housing Allowances: Simulations Using the TRIM Model, Urban Institute Working Paper 216-19, Aug. 1975.

2/By "imputed" we mean that data obtained from or based on one survey are attributed to each household or individual on another survey, usually using statistical methods.

FEDERAL ENERGY ADMINISTRATION

The Office of Consumer Affairs/Special Impact is the only office in FEA to use TRIM to date. 1/ They have completed their development of the Comprehensive Human Resources Data System (CHRDS) Phase I to provide a tool for evaluating the impact of proposed energy programs on household consumers, cross-classified by a large variety of demographic and economic characteristics at national, regional, State, and local levels.

TRIM is an integral part of CHRDS since, in order to permit the needed demographic, economic, and geographic cross-classifications, CHRDS is being designed as a file of sample micro-data on individual households and their component persons. Basically, CHRDS is to be developed in the following steps:

--Initial data base preparation.

--Updating the data to the current year.

--Enriching the file with additional energy data.

--Projecting the data to a future year.

The initial data base preparation involves drawing a subsample of the 1970 Census Public Use Sample, and performing the reformatting and recording operations that are necessary to TRIM processing. The updating involves adjusting the data to control totals from the latest published administrative statistics on demographic characteristics, employment, and income distribution. Next, missing or outdated types of information, such as transportation and energy use data are imputed. Other information necesseary for the derivation of disposable income such as tax and transfer program payments, which are not reported or are underreported on the basic file, will be simulated by TRIM and added. The data are then projected to a future year in accordance with Census and other projections using one of the TRIM aging procedures. The final stage of the system simulates the energy consumption in order to evaluate the effects of various energy programs for future years.

1/This group is now the Office of Consumer Affairs within the Office of Intergovernmental and Institutional Relations, Department of Energy.

FEA is in the process of putting TRIM on their computer system so that they will be able to do most of the work in-house in the future. FEA intends to incorporate the Survey of Income and Education (SIE) data base into CHRDS when it becomes available as well as incorporating some additional MATH modules into CHRDS.

CONGRESSIONAL BUDGET OFFICE

The Congressional Budget Office (CBO) is a recent user of TRIM. Their first use of the model was in 1975 for projecting growth of selected Federal income assistance programs to the year 2000. More recently, CBO used the MATH version of TRIM to analyze income distribution effects and the aggregate budget impact of major welfare program reform alternatives. Both of these efforts are described more thoroughly below.

A distinction between other users of TRIM and CBO is that the former have been concerned primarily with effects and impacts on their specific program(s), while CBO's analysis deals with all the programs. In their first use of the model, CBO used TRIM to produce long-range estimates of the costs and caseloads of the SSI, AFDC, and Food Stamp programs, while other methods were used to estimate the remaining income assistance programs (Social Security, Government pensions, Veterans' benefits, Medicare, and Medicaid). For this analysis, considerable effort was required to demographically and economically age the 1973 CPS data base to the year 2000. Simulations were performed for various options reflecting current law, price inflation, and changes in productivity. 1/

CBO's more recent use of TRIM was to describe income distribution effects and the aggregate budget impact of all current income assistance programs and tax laws as well as major alternatives for 1978 and 1982. They used the MATH version of TRIM to estimate the costs and caseloads for the Food Stamp, AFDC, SSI, and Federal income tax programs. Again, other procedures were used to estimate the costs of the Social Security program, Veterans' benefits, Medicaid, and other programs. Much of the effort of this contract was devoted to data base modifications, such as adjusting the data base to correct for income underreporting, and developing a new procedure for demographically aging the data base.

1/The results of this study contained in Growth of Government Spending for Income Assistance, A Matter of Choice, a Committee Print, dated Dec. 3, 1975, for the Committee on the Budget, U.S. Senate.

CBO has expressed a desire to work with the contractor to develop a permanent staff capability for performing analyses of the above type, possibly using the H.I.S. version of TRIM and H.I.S. staff support.

OTHER CONGRESSIONAL USERS

We have identified a number of other uses of TRIM in the legislative branch. These include the

--preparation of an issue paper for the Congressional Research Service, Library of Congress, concerning estimating the population eligible for food stamps; 1/

--use of TRIM by the Senate Agriculture Committee to analyze alternative plans concerning Food Stamp program reform; and

--use of TRIM by the Subcommittee on Fiscal Policy, Joint Economic Committee, to analyze welfare reform alternatives including the proposed Allowances for Basic Living Expenses program. 2/

Also, in anticipation of continued usage by the legislative branch, H.I.S. has installed TRIM on its computer system and has a small staff available to respond to congressional requests to use the system. As we mentioned earlier, the analyses we conducted (see ch. 6) were made using the H.I.S. version of TRIM.

USE OF TRIM BY STATE GOVERNMENTS

The use of TRIM as an analysis tool at the State level began in 1973 when it was used to project future costs and caseloads of various public assistance and tax programs for the States of Michigan and Washington. Heretofore, the model was used to project cost estimates at the national level. Michigan no longer uses TRIM but Illinois is planning to incorporate TRIM as a submodel of a larger model called the Illinois Policy Model which is expected to become fully operational in 1977.

1/Harold Beebout, Estimating the Population Eligible for Food Stamps, CRS, Feb. 18. 1975.

2/Income Security for Americans: Recommendations of the Public Welfare Study, Joint Economic Committee, Dec. 5, 1974.

The State of Washington has been using TRIM for the past several years to simulate ongoing programs. Originally, the State used TRIM as an integral part of the Seattle negative income tax experiment funded by HEW. The State plans to use TRIM to perform additional research and long-range planning to identify the

--impact and the incidence of the proposed State income tax on the general population,

--amount of revenues to be derived by the implementation of an income tax scheme, and

--impact of negative income tax proposals on the State's existing income maintenance program.

In 1973 the Michigan Department of Social Services contracted to use TRIM for the purposes of

--estimating future costs and caseloads of the State's public assistance program and

--providing better estimates of the number of individuals eligible for public assistance programs with complex eligibility criteria, such as AFDC.

Michigan indicated that they discontinued the use of the TRIM model in 1973 because they were dissatisfied with TRIM's ability to estimate the State's AFDC-eligible caseload. For example, 1972 simulations for single-parent families produced a participation rate of 143 percent for single families eligible for AFDC in Michigan which indicated to them that there were definite problems with the TRIM techniques for projecting Michigan AFDC caseloads. The Department presently uses several econometric models to make its State projections for the AFDC program and the State's general assistance program.

Illinois is incorporating TRIM as a submodel (component) of the larger Illinois Policy Model now under development by the Illinois Bureau of the Budget. The Illinois Policy Model is being designed to combine two modeling methodologies--macroeconomic modeling and microsimulation in order to provide an output that gives both a macro-overview and microdistributional picture. TRIM will provide the microsimulation capability for the system. The Illinois Bureau of Budget intends to use the Illinois Policy Model to analyze the direct and indirect effects of State or Federal policy on the industrial sectors of the State, employment, and income. Although TRIM

will be a component of the multifaceted Illinois Policy Model, Illinois also plans to use it independently to project the State's caseload and costs for the various income transfer programs. These projections are to be used in the formulation of Illinois' fiscal year 1978 budget and for planning for fiscal years 1978-82.

CHAPTER 4

TECHNICAL DESCRIPTION OF THE TRANSFER INCOME MODEL

The previous chapters provided a brief overview of TRIM and its governmental uses. This may be sufficient for the analyst or decisionmaker who is not interested in exercising the model at this time, but nevertheless wishes to obtain some understanding of the model's structure and operation. This chapter is addressed to the analyst or decisionmaker who envisions a possible application for the model based on the previous material but first needs to know more about how the model simulates the income transfer area.

The following sections describe, in considerable detail, the TRIM basic components identified in figure 1.1/

TRIM DATA BASES

The first, and perhaps the most important, component of the TRIM system is the data base on which TRIM carries out its calculations. As we mentioned earlier, TRIM is a micro-simulation model. Consequently, its inputs must be in the form of what is known as a microdata file. The term "microdata" is used to refer to the fact that the total sample consists of observations which are recorded for individual decisionmaking units, such as persons, families, or households. A TRIM data base also must

- --be representative of the population as a whole in the sense that a "weight" is associated with each observation which inflates the individual sample to the segment of the entire population which it represents;
- --have sufficient sample size to insure the needed accuracy of distributional detail;
- --be reliable in that valid sampling and editing procedures have been used;
- --contain information on individual persons, preferably with family and household information as well; and
- --contain requisite information on income and other economic, social, demographic, and geographic characteristics of the persons and families.

1/We have attempted to avoid using computer jargon whenever possible, and, for the most part, we do not discuss the mechanics of running the model.

The specific information which a TRIM data base must contain depends to some degree on the programs simulated. However, a set of data commonly required by the tax and transfer program modules can be listed. Common demographic data requirements include such items as age, sex, household-family relationship, marital status, student status, residence, and work experience. Economic data requirements include the reporting of the income and asset holdings or income received from asset holdings. Income should be disaggregated as finely as possible so that the types and sources of income can be identified. TRIM disaggregates income into 14 separate sources.

Any data base possessing the characteristics described above is a potential TRIM data base. Major data bases which have been used in producing TRIM estimates include the March Current Population Survey, the 1967 Survey of Economic Opportunity (SEO), and the 1970 Decennial Census Public Use Sample. Recent developments have prompted the use of additional data bases. For example, merged files have been used by the Department of the Treasury (merging Statistics of Income data and Current Population Survey Data) and by Social and Rehabilitation Service, HEW (merging a stratified subsample of the 1970 CPUS and the 1973 AFDC Survey). 1/ Other potential data sources include the newly released 1973 Annual Housing Survey and the Survey of Income and Education, conducted during March, April, May, and June of 1976, but not yet available.

Four of these data bases are described in more detail below. The March CPS is generally considered to be the primary data base for TRIM and is discussed first. SEO and CPUS are then described. Finally, since SIE is expected to become an important new data base, it is described briefly. It will be evident from these descriptions that the selection of the data base to be used in producing TRIM estimates

---

1/It is appropriate to mention here that there has been considerable debate about merging data files, matching data files, and creating synthetic data files. The experts do not agree on the validity of the procedures which have been adopted. Some discussion and further references may be found in "The Annuals of Economic and Social Economic and Social Measurement," Vol. 1, No. 3, pp. 325-357, dated July 1972. In addition, the entire April 1974 issue of this Journal is devoted to surveys and microdata; it contains several interesting articles and discussion relevant to the entire subject of data bases such as one required by TRIM.

is dependent on the specific application. Each of the data bases is superior to the others for some given purposes. A comparative summary of these data bases is contained in figure 4.

Current Population Survey

CPS is an annually recurring survey which collects information on a fixed set of questions each month and a supplemental set which varies from month to month. TRIM uses the March CPS which includes queries on income for the previous year and employment status for last year, and last week. The sample covers the resident, civilian, non-institutional population of the United States, and those members of the Armed Forces in the United States who live off-post, or on-post with their families. Approximately 47,000 households (about 130,000 individuals) are interviewed. The March CPSs from 1968 to 1975 inclusive are currently available for use as TRIM data bases.

Several properties of the CPS which make it a desirable survey for use as a microdata base for TRIM are listed below:

--The survey is reported annually, and is generally available less than a year after the survey is taken, providing a relatively "current" data base.

--CPS contains most of the demographic, social, and economic information needed to simulate the tax and transfer programs.

--It is a representative sample of sufficient size to allow analysis of the distributional effects of transfer programs, although not generally to the State level of geographic detail.

--The quality of the data and editing procedures is high.

The CPS also has several shortcomings which make alternative data bases better for some purposes. For example

FIGURE 4. COMPARISON OF CPS, SIE, CPUS, AND SEO DATA BASES

CHARACTERISTICS OF DATA	MARCH CPS	SIE	1970 CPUS	1967 SEO
Currentness	Survey taken annually; usually available in less than 1 year after survey. Income data from previous year.	1976 Survey based on 1975 income data. Not yet available. Will require considerable reprogramming of the data modification routines and reformatting of CPSEO file for use by TRIM.	Survey repeated every 10years, last one based on 1969 income data.	1967 Survey based on 1977 income data.
Geographic Unit	Shows States except for small States which are grouped. No SMSA	Shows all States. Designed to measure poverty population in every state.	One file shows States, another shows large SMSAs and country groups.	SMSA but no State
Demographic Data	Little information on health or disability.	Fairly detailed information on health and disability, poverty, and education.	5-percent sample has health and disability information.	Information on health and disability effects on employment.
Social Unit	Detailed information on family and household structure.	Detailed information on family and household structure.	Family structure can be constructed by imputation.	Contains information on those who left the household. No sub-family record.
Employment	Sufficient information available for previous year.	Sufficient information available for previous year.	Less detailed information on previous year's work; no information on weeks of unemployment or reasons working only part time or part year.	Adequate information.
Income	Income reported for all persons 14+. Restrictive definition of income, cash received. Earned income—3 sources. Unearned income—5 sources. Income from each source is aggregated but indicator of subsource is given.	Similar to CPS, but includes in-kind income not on CPS. Earned income—3 sources. Unearned income—8 sources. Income in each category is aggregated but indicator of subsource is given.	Earned income from 3 sources as in the CPS. Unearned income is aggregated to 3 sources with no indication of subsource.	Income reported for all families (including "left unit"). Same cash received definition as in CPS. Earned income from 3 sources for all persons 14+. Unearned income for families only reported by subsource.
Assets	None	Information on rent and mortgage paid and value of home.	Information on rent paid and value of home.	Detailed asset information.
Sample Size	Approximately 50,000 families and 150,000 persons. Adequate for U.S. and possibly for large States but not for smaller geographic areas.	Sample includes approximately 150,000 households.	Excellent. Can produce accurate tabulations for small States and SMSAs.	27,000 families and 93,000 persons with over sampling of low-income nonwhites.

Note: This table was taken from Lou Koenig and Harold Beebout, "A Data Base for Microsimulation: Commonly Formatted CPS-SEO-PUS." Public Data Use, vol. 2, no. 2, April 1974, p. 25.

--CPS contains little information on disability and health necessary to determine categorical eligibility for transfer programs such as Supplemental Security Income;

--CPS does not contain information on assets;

--CPS lacks information on wage rates, which is necessary in simulating transfer programs incorporating wage rate subsidies; and

--all the Census Bureau data files employ a restrictive definition of personal income.

Survey of Economic Opportunity

In 1967, the Bureau of the Census conducted the SEO for the Office of Economic Opportunity. The SEO file of 30,000 households, consists of a national sample of approximately 18,000 households, and an additional 12,000 households drawn from areas with large nonwhite, low-income populations. The latter was chosen to provide better detail on the characteristics of the nonwhite poor. Like CPS, SEO employs a household-family person format and contains essentially the same information on every individual within the sample household.

The advantages of SEO over CPS as a TRIM data base are:

--SEO contains relatively detailed asset information and information on health impairment.

--SEO's sample design includes proportionately more low-income families.

Several disadvantages of SEO over CPS as a TRIM data base are:

--The data are becoming outdated (income data are over 11 years old and demographic data are over 10 years old).

--Unearned income by source was collected on a family rather than a person basis.

The 1970 Decennial Census Public Use Sample

CPUS was produced by selecting 1 out of every 100 basic records from the 1970 Decennial Census (smaller samples of

1 in 1,000 and 1 in 10,000 records are also available). Two supplementary questionnaire forms were distributed during the 1970 Census with 5 percent of the population receiving one type of long questionnaire and 15 percent of the p pulation receiving a second type of long questionnaire. Separate 1 in 100 data files were produced from the responses to each of these long questionnaires. Thus, while each of these is actually a 1 in 100 sample, they are referred to as the 5-percent sample and the 15-percent sample. While TRIM can use either of these samples, the 5-percent sample is preferred because it contains health impairment information.

The CPUS file contains most of the data contained on CPS and is superior to CPS in the following:

--The sample size of CPUS is large enough to permit transfer program estimates for even small States or the large standard metropolitan statistical areas (SMSAs) with an acceptable sampling error.

--CPUS contains information on amount of rent paid and value of home, which is important in the simulation of certain tax and transfer programs.

However, CPUS also has several weaknesses as a TRIM data base. For example

--it contains much less detailed information on the past year's work experience;

--it lacks detailed information on the source of income; and

--it is collected only every 10 years and the 1970 data--for income and work experience in 1969--is already outdated.

Survey of Income and Education

The primary purpose of this survey is to determine for each of the States the number of children age 5 to 17, inclusive, living in families at or below the poverty level. The criteria of poverty is that used by the Bureau of the Census in compiling the 1970 Decennial Census.

The sample for SIE consists of approximately 150,000 households. SIE should possess all the aforementioned advantages of CPS, and several of the CPS disadvantages have been rectified. For example, SIE has additional social and

demographic information, especially for children, and more information on public assistance and food stamp recipiency, housing costs (e.g., house value, mortgage value, rental subsidies), other assets, disability, and health insurance coverage. However, SIE may pose the following problems:

--The basic TRIM data format may need to be revised and the data modification procedures will undoubtedly need to be reprogrammed if SIE is used.

--The sample size of SIE is several times that of CPS--this implies that it will take the computer considerably longer to process the SIE data file. Since it is already very costly to run TRIM, this will probably necessitate sampling the SIE sample to get computer running time down to no more than its present level--thus introducing additional uncertainty to the results.

INCOME UNDERREPORTING

Finally, it should be mentioned that there is one weakness which is common to all of the data bases described above--the underreporting of income. This underreporting is of two types:

--Reporting less income than received.

--Nonreporting of income received.

The degree of severity of underreporting varies across income sources as well as among data bases as is shown in table 1. Using the underreported income could lead TRIM, for example, to overestimate the size of the poverty population and the dollar cost and coverage of the means-tested programs. The desire to address this problem was the primary reason the Department of the Treasury created the merged file mentioned earlier.

PREPARING THE DATA BASE

Once a data base has been selected it must be prepared properly for use in TRIM. There are three main steps in this process.

--The first phase of this process consists of converting the data into standardized TRIM format called CPSEO (from CPS/SEO). This step also involves discarding superfluous information, range checking of variables to insure that they fall within specified limits,

TABLE 1. COMPARISON OF INCOME UNDERREPORTING PROBLEMS OF THE SEO AND CPS DATA BASES

INCOME	1967 SEO ESTIMATE (1)	INDEPENDENT ESTIMATE (2)	DIFFERENCE (1) - (2)	PERCENTAGE CHANGE (1) - (2) / (2)	1974 CPS	INDEPENDENT ESTIMATE	DIFFERENCE (1) – (2)	PERCENTAGE CHANGE (1) – (2) / (2)
PERSONAL EARNINGS:								
Salaries and wages	$353.8	$394.6	-$40.8	-10.3	$656.7	$676.3	-$19.6	- 2.9
Farm and non-farm self-employment	47.9	41.0	+ 6.9	+16.8	71.1	88.3	- 17.2	-19.5
INCOME – OTHER THAN EARNINGS								
Interest, dividend and rents	20.0	31.6	- 11.6	-36.7	36.7	83.0	- 46.3	-55.8
Social Security	17.4	21.3	- 3.9	-18.3	44.7	50.0	- 5.3	-10.6
Unemployment compensation, Workman's compensation, Gov't employee pensions, and Veteran's payments	10.5	13.1	- 2.6	-19.8	19.8	34.2	- 14.4	-42.1
Public Assistance	3.5	4.3	- 0.8	-18.6	8.2	11.0	- 2.8	-25.4
TOTAL (note a)	$453.1	$505.9	-$52.8	-10.4	$837.2	$942.8	-$105.6	-11.2

[a]Partial data obtained from An Analyst's Guide to TRIM – The Transfer Income Model, Margaret B. Sulvetta, Urban Institute, Washington, D.C. The sources for the independent estimates were various Department of Commerce; Department of Health, Education, and Welfare; Department of the Treasury; and Veterans' Administration publications.

transforming household records into family records where necessary, and other related processing.

--The second phase converts the new CPSEO formatted data base into a form which is much more efficiently processed by a computer.

--The final phase performs several data base modifications. Due to the length and complexity of this phase in the processing, it is discussed in more detail in the following section.

MODIFYING THE BASE YEAR DATA

The data bases used by TRIM were not specifically developed for TRIM. Consequently, a considerable amount of data modification is required in order for the data base to contain the necessary information to be useful for TRIM purposes.

The computer programs in the data modification module, for the most part, add information to the person records in the newly organized data base. That is, based on the initial information contained in the data base, the existing information is restructured and additional information is inferred.

One of these computer programs, for instance, classifies persons according to various status definitions which must be known in order to later determine each person's eligibility for a particular transfer program. Included procedures classify persons according to their age, marital status, health status, student status, and military status. For example, a person's health status and age must be known in order to determine whether or not that person is eligible for the Supplemental Security Income program. Once these status variables are determined for each person in a family, they are added to the family's person records.

Another collection of computer programs groups family members into various filing units according to the diverse rules of various existing and proposed tax and transfer programs. For example, the filing unit used for purposes of the Federal personal income tax is very different from the unit used for purposes of the public assistance programs. These filing unit definitions are critical to the successful simulation of the tax and transfer programs, and they are discussed in more detail in the sections describing the transfer programs.

A third set of computer programs allocates any unearned income received by the family to the particular sources from which it came and to the individual persons in the family for whom the income was intended. These allocations are made because data as reported in the CPS often group together income received from more than one program (e.g., unemployment compensation and veteran's payments are reported together on the CPS). The allocations to particular persons in the family are made because the survey reporting unit is often larger than the filing unit appropriate for a given transfer program. In order to determine income eligibility of such smaller filing units, it may be necessary to know the amount of unearned income received by each individual person in that filing unit.

Still another computer program can be requested which attempts to correct for survey underreporting of income, mentioned earlier. Then, the total corrected amounts are approximately equal to independent estimates published by various Government agencies. 1/ If income correction is desired when using TRIM, both the reported (uncorrected) and corrected income figures are retained on the family and person records. Computations may be made then with either the reported or corrected figures. However, due to various problems this procedure is rarely used. 2/

In conclusion it should be stated that for some of these data modifications the decision rules used to make the data modifications naturally rely on the subjective judgment of the analyst who developed the decision rule. In chapter 6, we will show how this can lead to considerably different results.

PROJECTING THE DATA BASE TO REPRESENT A FUTURE YEAR

The purpose of the data projection module is to adjust the data base in a manner such that the modified data reflect as closely as possible the demographic, economic, and, to a limited extent, unemployment characteristics of the population in the year of interest. From the time a data base being used by TRIM is developed (e.g., March 1975 in the case of the CPS) to the year being simulated (e.g., 1977 or 1980) it is

---

1/See footnote in table 1.

2/See "Editing Census Microdata Files for Income and Wealth," Annuals of Economic and Social Measurement, Vol. 2, no. 2, April 1973 by Nelson McClung.

likely that the population has grown, but at different rates for different subgroups; personal income has changed in response to changes in productivity, price changes, and for other reasons; and there may have been observed or projected changes in the unemployment rate. Each of these factors can have an important impact on tax and transfer programs caseloads and cost estimates, and consequently adjustments to the data base must be made. In fact, since the most recent survey for any of the TRIM data bases is about 2 years prior to the current year (i.e., as of February 1977, the March 1975 CPS was the most current March CPS data base available), the data projection module must be used in order to simulate current year estimates of programs.

The data projection module includes computer programs which

--project (i.e., age) the data base demographically and economically and

--adjust the data base for observed or projected changes in the unemployment rate.

The aging process in TRIM is termed a comparative static procedure because the process is simply a two-step readjustment of family and person weights and reported income using a set of multipliers 1/ at each step. Individuals do not grow older, leave their parents' homes to form new households, marry, divorce, or die; nor do they change their labor force behavior. 2/ Rather, a family in the data base is aged to represent a family of similar characteristics in the simulation year. What does change is the weight attached to the family (i.e., the number of families with these characteristics) and the income received by the family.

The first step of the aging procedure consists of adjusting the weights attached to each family and person

---

1/A multiplier is merely an adjustment factor. For example, if one wanted to adjust 1975 earned income to reflect 1976 earned income, the multiplier for a 5-percent inflation rate would be 1.05.

2/Current work being performed for the Social and Rehabilitation Service is aimed at developing a combination of dynamic and static procedures to project the data base forward. The static TRIM procedures would be augmented with dynamic procedures to simulate births, death, divorce, and marriage.

record on the data base so that each record represents a new number of persons or families consistent with control totals obtained from Bureau of the Census population projections. This is done by applying a set of demographic multipliers derived from these control totals to the original weights. The second step consists of inflating income to reflect known or expected changes in earned and unearned income. The income adjustment is made by applying a set of income multipliers that vary by income source and in some cases demographic characteristics to the previously reweighted population.

There are a number of aging options which a TRIM user may choose among in order to age the data base. Because of the importance of this aspect of TRIM, these options will be discussed at some length in the following sections.

Demographic aging

There are five demographic aging options in the H.I.S. version of TRIM. Each of these options uses information from aggregate Bureau of the Census population projections to derive the aging multipliers which are then applied to the sample weights on the data base to age the data base demographically. These options vary in the detail in which the demographic factors (i.e., age, race, sex, location, family characteristics) are described and the procedure by which the aging multipliers are derived (see fig. 5). Further clarification of the differences among these options follows.

As the figure shows, options 1 and 2 are quite similar and rely on hand calculations to develop the aging multipliers. Option 3 is much more detailed and relies on a computer program to develop the aging multipliers. However, we were unable to test option 3 because it was not operational on the H.I.S. version of TRIM at the time of our review. It was indicated to us that the procedure is difficult to implement and consequently is not used widely by TRIM users.

It is recognized that the above options fail to account for known or expected shifts in family composition, such as the smaller family size resulting in a reduced number of children as a percent of the total population. Note that in figure 5, the age factor for these options is not very detailed. The result has been that these options have overstated the number of children on those aged files significantly. Options 4 and 5, which have been developed recently, each try to improve upon these other aging options in this respect. Each uses a multiple step procedure by which person, household, and, finally, children sample weights are adjusted,

FIGURE 5. SUMMARY OF DEMOGRAPHIC AGING OPTIONS

DEMOGRAPHIC AGING OPTION	DEMOGRAPHIC DETAIL						HOW THE AGING MULTIPLIERS ARE DEVELOPED	INTENDED RESULT
	AGE	RACE	SEX	FAMILY STATUS	LOCATION	OTHER		
1	Less than 65 Greater than or equal to 65	White Non-white	Male Female	None	Northeast North Central South West	None	Manually developed based on Bureau of Census population projections	An aged data base using 32 distinct aging multipliers (i.e., each person in the data base is categorized into 1 of these 32 subgroups)
2	Same as 1	Same as 1	Same as 1	husband/wife household male head of house/no spouse female head of house/ no spouse individual	Same as 1	None	Same as 1	An aged data base using 128 aging multipliers
3	Less than 24 between 25 and 54 greater than 54	Same as 1	Same as 1	Same as 2 but with an added child distinction (e.g., husband/wife household with children and husband/wife household without child)	Same as 1	None	Computer developed using a least squares error minimization rule and Census population projections	An aged data base using 336 aging multipliers
4	14 age classes	Same as 1	Same as 1	5 household types and 9 age of head of household classes totaling 45 distinct multipliers	None	A children adjustment based on Census data on number of children per household	Computer developed with manual intervention at several steps to develop adjustment factors using Census population projection	An aged data base which reconciles the number of households, persons, and children to Census projection
5	Same as 4	Same as 1	Same as 1	Same as 4	None	A children adjustement based on Census data on number of children by age, race & sex	Computer developed using Census population projections	Same as 4

in that order, so that they are consistent with the Bureau of the Census population projections for these categories. Although both options use basically the same data, their procedures are quite different.

Demographic aging option 4 requires three separate computer runs that

--adjust the sample weights to capture the projected shifts in the population of persons,

--readjust the sample weights to capture the projected shifts in the composition of households, and

--reconcile the resultant number of children to agree with Census projections of the number of persons age 14 and under.

Intervention is required between each computer run to manually develop the multipliers for the next computer run.

Option 5 is completely automated and, generally speaking, easier to implement. It requires inputing Census projections broken down to the demographic detail described in figure 5. The data base then is retabulated at the household and person level so the base year data is organized consistent with the demographic detail of the input data. Then mathematical conditions are set to perform the three-step adjustment of persons, households, and children with no manual intervention. Other differences between options 4 and 5 will be discussed in chapter 6.

Economic aging

There are currently three economic aging options in TRIM. The primary difference among these options lies in the degree of detail that economic factors being aged are described.

In option 1, multipliers are derived by extrapolating from recent economic trends obtained from published data on income and vary only by source of income. The sources of income are broken down into 14 categories which include wages and salaries, farm self-employment, nonfarm self-employment, social security or railroad retirement, rent, interest, dividends, welfare or public assistance, workmen's compensation, unemployment compensation, veteran's payments, Government pensions, private pensions, and other income. It is implicitly assumed that income grows at a uniform rate for all categories of persons.

The second economic aging option is identical to the first except for one category of income--wage and salary income--which comprises, by far, the largest share of total family income. Multipliers for wage and salary income are estimated by a simple regression model which relates wage and salary income changes as a function of the sex, race, and occupation of the person, and the Consumer Price Index. A set of 52 multipliers for wage and salary income is derived as opposed to the single multiplier of option 1. Multipliers for all other categories of income are the same as those used in option 1.

The final economic aging option involves a two-step process and is used in conjunction with demographic aging option 4. The first step is identical to the procedure described in option 1 with the only difference being the derivation of the aging multipliers. The multipliers used in this step are based on the rates of change in the economic aggregates for the principal income components (wage, self-employed farm, self-employed nonfarm, rent, interest, and dividends) and the rate of change in the Consumer Price Index for the remaining income components. The source of the aggregates is the Survey of Current Business for historical periods and the Data Resources, Incorporated, model for future periods. 1/

The second step is a byproduct of the demographic aging process. Demographic aging, by itself, increases total income on the data base simply because after the aging there are more people represented on the data base (i.e., the person weights have been increased) and income amounts for each person's record have not changed. However, the aggregate data used to develop the economic aging multipliers already accounted for population increases. When these multipliers are used to adjust the income amounts in the data base, the increased population effect on total income is accounted for twice. The second step deflates income slightly to counteract this unintended result.

The other aging adjustment that can be made adjusts for changes in the aggregate unemployment rate.

1/The Data Resources, Incorporated, model is a large econometric model of the U.S. economy. Other similar models could be used as sources for this data but to date, only the Data Resources, Incorporated, model has been used.

Adjusting the unemployment rate of the data base

The purpose of the unemployment rate adjustment process is to modify a data base to reflect known or expected changes in the unemployment rate between two periods of time. The unemployment rate is considered an important variable in transfer program simulations because changes in the rate have been linked to changes in the costs and caseload of welfare programs.

The unemployment rate adjustment process in TRIM is recognized as a weak link in the system and will be discussed only very briefly. The unemployment rate adjustment process is quite elaborate but is designed in such a manner that a considerable amount of effort is required to develop parameters necessary to change the unemployment rate between two specified rates. Currently, parameters exist only for the rate changes of 3.8 to 5.0 percent; 3.8 to 5.6 percent; 4.9 to 5.9 percent; and 5.0 to 6.7 percent. Also, the computer program as currently designed cannot simulate a decrease in the unemployment rate. This aspect of the procedure is especially limiting since the more current data bases reflect the high unemployment rate of recent years and it is likely that analysts would want to assume a lower unemployment rate for some of their future year simulations.

Up to this point, we have described the TRIM data bases and the computer procedures which modify or age the data bases. It should be apparent that this aspect of TRIM represents a considerable portion of the system. The following sections describe the modules which simulate the income tax and transfer programs.

SIMULATING TAX PROGRAMS

Because many transfer programs use after-tax income as part of their income eligibility tests, it is necessary for TRIM to simulate Federal income tax and employee payroll taxes. This section will describe how these tax programs are simulated in TRIM. Each description will include a brief explanation of the procedures involved and the standard output. The first part describes the simulation of the Federal income tax program, and the second part describes the simulation of employee payroll taxes.

The Federal Individual Income Tax Program

The initial step in simulating the Federal Individual Income Tax Program involves identifying individual tax filing units. This process is somewhat complex because of the difficulty of determining which persons in the household are the dependents of which filing units. The general filing unit definer procedures contained in the data modification module, mentioned earlier, are used to accomplish this task. Three searches through the household filing unit are required in order to identify the individual filing units. This is done by grouping the persons within the household into joint units or single units based on their marital status. Nonjoint units are classified based on their household relationships as to whether they could be a dependent on another return within the household. Each tax unit within the household is classified also as to whether it could have a dependent on its return. In the third step, the number of exemptions for each return is determined using family relationship, age, student status, and support test to determine dependency. If a net tax savings for the entire family would result, subfamily members who would have been a dependent on a subfamily head's return are imputed to the primary family head's return if they meet the support test. In a fourth step, capital gains are imputed.

For those tax units legally required to file, receipt of capital gains is imputed randomly using a probability for each adjusted gross income (AGI) class derived from Internal Revenue Service tabulations of tax returns. For units selected to receive capital gains an amount equal to the average capital gains received in their AGI class is imputed.

Having determined the adjusted gross income for each return, an assignment is made then as to whether each return would have itemized its deductions. This is done probabilistically based on the proportion of returns which were itemized in their AGI class. An average amount of itemized deductions is then imputed for those returns which were selected in the above step based on their level of adjusted gross income. In the final step of the income tax simulation, total income tax liability is computed using the tax rules and rate schedules provided by the Internal Revenue Service. The computed tax, less any credits, is stored with the person who has been identified as the head. The output from the module includes the tax liability and the number of units with taxable and nontaxable returns by type of return filed.

Payroll tax program

The payroll tax programs simulated by TRIM include the

--Social Security, officially designated as the Old Age, Survivors, Disability, and Health Insurance;

--Railroad Retirement Act; and

--Federal Civil Service Retirement System.

The payroll tax module is relatively simple. The filing unit is the individual worker. The simulation is carried out in two main stages. First the universe of contributing workers is identified, and then taxable income and tax liability are determined. The universe of contributing workers is broken down into three basic categories. It is defined first for the railroad retirement and Federal civil service programs; then the remainder of workers with earned income are assumed to contribute to social security. The workers contributing to railroad retirement are assumed to be all those persons in private industry who listed railroad or railway express as the industry where they held their longest job during the previous year. Individual workers who contribute to the Federal civil service program cannot be directly determined from the CPSEO file. This file does not specifically distinguish Federal Government workers from other government workers. However, it does list a general industry class of government. To compensate for the lack of unique identification, the Federal worker classification is imputed. Only those workers listing government are included in the imputation procedure. Workers in occupations with significant numbers of Federal civil service workers who also work for some other level of government are selected for the Federal worker classification according to a given probability. The probabilities were determined by reconciling CPS tabulations with Civil Service Commission data. The potential universe of workers contributing to social security is then assumed to be all other persons with wage and salary income, plus all those with over $400 in self-employment income.

Once the contributing workers for these programs have been identified the payroll tax can be computed easily by applying the specific rules of each program. For example, for the Federal Civil Service retirement program the tax rate is 7 percent and all wage and salary income is taxed.

The basic program output of the payroll tax module shows the number of contributors and their tax liability by program type. The tax amount is stored in each contributing worker's record.

SIMULATING PUBLIC ASSISTANCE PROGRAMS

Once the data base has been modified and aged, and after the tax programs have been simulated, the public assistance programs can be simulated. This simulation is done in the Public Assistance module.

This module was developed to serve as a tool for helping to evaluate the impacts of proposed changes in several public assistance transfer programs. In particular, the module contains the coding necessary to produce estimates of numbers of eligibles and costs for the following public assistance programs:

--Supplemental Security Income.

--Aid to Families with Dependent Children.

--General Assistance.

--The now defunct Aid to Blind, Old Age Assistance, and Aid to the Permanent and Totally Disabled Programs.

A brief description of the existing programs will be presented before we describe how they are simulated by TRIM.

Supplemental Security Income program

The Social Security Amendments of 1972 established the SSI program effective January 1, 1974, to assist needy aged, blind, and permanently and totally disabled persons. The program, which replaced State-administered programs of Old-Age Assistance, Aid to the Blind, and Aid to the Permanently and Totally Disabled, provides minimum income to persons using nationally uniform eligibility requirements and benefit criteria.

Aid to Families with Dependent Children program

The AFDC program is the principal means-tested Federal program providing cash to the low income population. However, under the Social Security Amendments, which created the AFDC program, eligibility is based on more than financial need. Payments only go to certain categories of families where there is a dependent child deprived of parental support. Each State has a substantial amount to do with running these programs. Each State establishes the needs standard for that State, and if an individual's income is below the needs standards, then the eligible family qualifies for AFDC benefits.

In many States the determination under the needs standard is very complex and requires a detailed interview and budget examination for each family.

This detailed examination is due, in part, to the process by which AFDC eligibility is determined--a process significantly different from the other public assistance programs. Economic eligibility for AFDC is determined by a two-step process:

--First, family gross income and assets adjusted to exclude the few allowable exclusions from income is examined. If this is less than the allowed need standard, the family passes the economic eligibility screen.

--Second, for those families passing the eligibility screen, the gross income established in step one is decreased by all allowable deductions, such as the AFDC income disregard, child care, and work-related expenses. The resulting figure is then used in the determination of benefits.

General Assistance program

"General Assistance" is a generic term for all welfare programs run and financed solely by State and local governments. These programs have names like Home Relief, Emergency Assistance, and Poor Relief. The programs are generally designed to aid those persons or families which meet a State or locally defined need eligibility criterion, and who, in addition, receive no Federal aid.

How the public assistance module works

The module which simulates the public assistance programs examines those filing units (individuals, couples, families) identified by the filing unit definer procedure of the data modification module as being categorically (as opposed to economically) eligible for the different public assistance programs. These filing units are subjected to various means eligibility tests, the precise tests depending on the assistance program, the State of residence, and the type of filing unit. 1/ These tests can include:

--An income test. Is the unit's countable income less than a specified amount?

1/In addition, countable income and countable assets are usually defined differently for the various programs.

--An asset test. Does the unit have less than a specified amount of countable assets?

--A support test. Does the unit obtain support from another individual?

The module examines the net income and assets of each of the filing units. For those units which pass these means tests, the module then calculates the benefit payable according to the rules of the program. That is, as program eligibility is established, the module calculates the benefit to be received by the filing unit being examined. When the module has finished determining all benefits for a given filing unit, it makes appropriate entries in its internal files and moves on to examine the next filing unit.

Factors which complicate the public assistance simulation

There are a number of factors which complicate the effective simulation of transfer programs by the public assistance module. Some of these factors are the

--interrelationships among the several transfer programs,

--multiplicity of types of filing units,

--use of different accounting periods for different programs,

--lack of asset data in the CPS data base,

--lack of data on blindness in the CPS data base,

--lack of data on State standards for general assistance programs, and

--known income underreporting problem of the TRIM data bases.

Most of these complications are addressed by the public assistance module. However, the module's method of handling each of the complications introduces uncertainty into the estimates.

Interrelationships among the several transfer programs

The model, reflecting program definitions, distinguishes among units which received benefits from different programs. In particular, when the module examines units to determine eligibility for AFDC, it accords a different treatment to units already receiving SSI benefits. Also, within the TRIM simulation the class of those who are categorically eligible for General Assistance is defined as any family filing unit, no member of which receives federally aided public assistance. In short, the structure of the public assistance module requires that SSI, AFDC, and General Assistance programs be simulated, in that order.

Multiplicity of types of filing units

The actual transfer programs distinguish between different categories of persons seeking public assistance. In fact, different eligibility and benefit criteria are applied to each category.

In order to capture this distinction, the model identifies 10 types of filing units for the SSI program. The reason for using multiple filing units is to distinguish among categorical eligibilities (i.e., blind, disabled, or aged) and groups receiving benefits (i.e., a head-spouse couple, only one of whom is getting benefits; a single person, non-head of household; etc.). In AFDC simulations TRIM distinguishes six types of filing units. As in the SSI program, the reason for this differentiation is to identify more correctly those groups receiving benefits. For example, an AFDC unit in which one adult receives SSI benefits and a single parent AFDC unit are two of the six categories considered.

The final two filing units identify all those who are categorically eligible for General Assistance. The first of these consists of all persons in the family, where the family contains no federally aided, categorically eligible, public assistance persons and, in some States, no employable adult as well. The second of these final two filing units is a residual general assistance filing unit consisting of all members of the family who have not been included in any of the previous 17 filing units. This final residual assistance filing unit should contain only persons otherwise eligible for general assistance except for existence of an employable adult in the unit.

Different accounting periods for different programs

One problem in simulating public assistance programs is caused by differences in income accounting periods in the available data and in the various transfer programs. For example, eligibility for assistance programs is generally determined on a monthly basis, while the Census Bureau normally collects income data on an annual basis. If a filing unit has no income for part of the year and, at the same time, has an annual income greater than the needs standard when converted to an annual basis, use of an annual accounting period would miss its period of eligiblity.

TRIM has addressed this problem by incorporating two different accounting period procedures--a simple annual period and a more complex part-year procedure which is available for use in simulations of AFDC and Food Stamp programs. The part-year procedure allocates income into two periods on the basis of the "weeks worked" and "weeks not worked" of the unit's principal wage earner. After allocating unearned income to the appropriate period, the module performs separate eligibility and benefit calculations for each accounting period. Rather than make a policy determination as to the correctness of a particular accounting procedure, the public assistance module initially examines all filing units on both a part-year and full-year basis.

Lack of asset data in the CPS data base

Program regulations have established certain bounds on the amount and type of assets that can be held by a unit receiving public assistance. In particular, the SSI programs have limits for cash (or cash equivalent) assets of $1,500 for a one-person unit, and $2,250 for a two-person unit. However, the CPS does not contain asset data.

TRIM resolves this difficulty by using a surrogate for assets in the "asset test." The model first assumes that assets will produce a 6-percent return on investment. Under this assumption the $1,500 and $2,250 amounts would produce returns of $90 and $135, respectively. The module thus implements the "asset test" for the SSI program by comparing reported dividend, rent, and interest income with whatever levels have been selected for the surrogate.

The module further distinguishes between "asset" levels for the SSI and AFDC programs. While the $90 and $135 amounts are the preferred tests for SSI, an asset test is usually not used in AFDC simulations because of the diversity of State regulations.

Lack of data on blindness in the CPS data base

One of the categorical eligibility criteria for SSI is blindness. This is reflected in the organization of the TRIM public assistance filing units--categories seven, eight, and nine of filing unit seven describe three SSI units eligible because of blindness. However, the CPS does not contain information on blindness. As a consequence, TRIM usually ignores these three filing unit categories.

Lack of data on State standards for General Assistance programs

The General Assistance programs are administered by the State or local governments and are intended to provide relief to those who are in need but do not receive any federally aided public assistance. However, due to the lack of information about State standards and criteria, TRIM defines the economic eligibility and payment criteria for the General Assistance program exactly the same as those for AFDC.

Income underreporting

Income underreporting is known to be a problem with the data bases normally used in TRIM simulations. Programs such as AFDC with a two-step eligibility criteria can be particularly sensitive to income underreporting because, for units near the need standard, a slight increase in income may cause them to lose eligibility. However, unless the income underreporting is corrected by the data modification module (and this is rarely done), the income underreporting problem is ignored.

Output of the public assistance simulation

The public assistance module simulates both full-year and part-year accounting periods since some programs use one accounting period while other programs use the other. To be specific, a single use of the module will, in principle, produce cost and caseload estimates for these programs using two accounting periods, two support tests, and including and excluding a full standard test. The inclusion of a full standard test, in principle, simulates the effect of the previously described two-stage eligibility determination process of the AFDC program.

The normal output consists of five tables. Four of the tables present the four combinations of accounting period and

support test. These tables are further divided to show caseloads and benefits both before and after imposition of a full standard eligibility test. The fifth table is a single array called the "most appropriate eligibility option." In this table, the combinations of accounting periods, support, and full standard tests have been selected which most closely match the intent of the SSI program, the AFDC program, and the General Assistance program.

SIMULATING THE FOOD STAMP PROGRAM

After TRIM has made its public assistance eligibility estimates, it can simulate the Food Stamp program. This is accomplished in the Food Stamp module, which was developed for the Food and Nutrition Service, Department of Agriculture. Its purpose is to serve as a tool for assisting in evaluating the impacts of proposed changes in the Food Stamp program.

Before describing how the module simulates the Food Stamp program, a brief description of the program is warranted. When it began in 1962, the program was relatively small and designed to remove surplus commodities from the market while at the same time helping the needy. With the various changes in the program since then, the cost of the program has escalated to an estimated $5 billion in fiscal year 1976, and it serves over 17 million people. Households in which all members receive public assistance are automatically eligible for food stamps but other households may also qualify after an examination of their income, family size, and the values of some of their assets. The amounts of food stamps a participating household may receive varies with family size. The purchase requirement (the amount the household must pay to purchase the food stamps) varies with family size and net family income (gross monthly income less taxes and certain deductions). The difference between the amount of food stamps the household receives and the purchase requirement is the Food Stamp bonus value. This represents a cost to the Government. 1/

How the Food Stamp module works

In the flow of TRIM processing the Food Stamp module must be preceded by the tax modules and the Public Assistance module. The reason for this order is that participation in a public assistance program may automatically qualify a household for Food Stamps and Federal Insurance Compensation Act (FICA)

1/See footnotes on pp. 8 and 10.

taxes and Federal taxes are two of the items deducted from gross monthly income in determining net income for the Food Stamp program. When simulating the current program, the filing unit used is the household. If desired, a filing unit other than the household can be used to simulate a Food Stamp alternative.

To simulate the Food Stamp program, the module calculates the net income (with respect to the Food Stamp program) and assets of each household in the CPS file and following the rules of the Food Stamp program determines whether the household is eligible for food stamps. Households in which all members receive public assistance are not screened for income eligibility as they are automatically eligible for Food Stamp benefits. For those households eligible, the Food Stamp bonus value is calculated and, using the household weights, the national totals for the eligible population and bonus value are estimated. Food Stamp program participation is estimated from the Food and Nutrition Services' September 1975 Annual Household Survey of the Characteristics of Food Stamp Recipients. Finally, the module outputs tables which identify the number of eligible households and participating households and the resulting bonus values as a function of household size and gross monthly income for an average month. There is also the option to estimate and output these figures on a yearly basis.

Factors which complicate the Food Stamp simulation

The process described above is straightforward but implementation is complicated by several factors, the

--lack of gross monthly income data in CPS;

--known income underreporting problem of CPS;

--lack of asset information in CPS;

--lack of sufficient information in CPS on allowable deductions for the Food Stamp program;

--fact that the Public Assistance module estimates eligibility in a public assistance program, not participation, and the general assistance estimates are acknowledged to be poor; and

--need to estimate participation in the Food Stamp program, not just eligibility.

Each of these three items is addressed by the Food Stamp module, but in each case the method the module uses to handle the complication introduces uncertainty into the Food Stamp program estimates.

Computing gross monthly income

The CPS data base does not contain monthly income data. Since monthly data are needed to determine Food Stamp program eligibility, the model computes gross monthly income for each household using a combination of survey week and annual earnings and employment data, data on unearned income other than public assistance, and simulated public assistance.

Accounting for income underreporting

An adjustment for income underreporting is made by the Food Stamp module. The adjustment does not correct the underreported income. Rather, income-eligible households are eliminated from further consideration based on the probability that the income-eligible household would be ineligible if the household's income had been reported correctly. The table of probabilities used to eliminate eligible households is a function of the age of the head of the household, employment type, the sum of the household's rent, interest and dividend income, and the relationship of the household's income to poverty-level income. The table was developed using a CPS data base that contained both uncorrected and corrected income. 1/ Using this data base, the incidence of households failing the Food Stamp income test as a result of the correction for income underreporting was tabulated to develop the table of probabilities.

Imputing Food Stamp countable assets

Asset information is imputed to the TRIM data base as part of the Food Stamp program simulation process. Food Stamp countable assets (other assets are ignored) are estimated as a function of the household's economic and demographic characteristics from Survey of Economic Opportunity data. This is implemented in the Food Stamp module by using a set of regression equations which were estimated using the SEO data. Four regression equations are used--one for each of four age of head of household categories. The conceptual model underlying the regression equations emphasizes a life cycle approach in

---

1/The accuracy of the income correction procedure used is difficult to assess. (See p. 26.)

which savings behavior and the position of the family in its life cycle are key determinants of the amounts of a family's assets. It hypothesizes that assets are a function of the age of household head, current income, occupation, marital status, residence, and self-employment.

Imputing Food Stamp deductions

Five types of deductions allowed as deductions from gross income in computing Food Stamp net or countable income are imputed to the TRIM data base by the Food Stamp module. The five deductions are: medical expenses when they exceed $10 per month, child care expenses, education fees, unusual (hardship) expenses, and shelter costs in excess of the deductible. 1/ These deductions are estimated based on data from the September 1975 Annual Household Survey of Food Stamp Recipients. Two other deductions, mandatory taxes (FICA and Federal taxes), and the 10 percent work allowance up to $30 per month are computed by the model directly. Using the September 1975 survey, a regression equation was estimated for each of the five types of deductions giving the probability of a household taking the deduction as a function of the household's economic and demographic characteristics. Another set of regression equations estimated the dollar values of each of the deductions as a function of the households' economic and demographic characteristics. The Food Stamp module then uses these equations to

--select households to take the deductions according to the estimated probabilities and

--compute, for each deduction type, a deduction amount for each household selected to receive that deduction.

Simulating participation in the public assistance programs

Rather than use the estimates of those eligible for public assistance determined by the public assistance module (a number considerably more than those actually participating), the Food Stamp module simulates participation in each of the public assistance programs based, in part, on those determined eligible by the Public Assistance module. In particular for the AFDC program, participants are selected from the list of TRIM-determined eligibles according to the probability of participation in the programs as a function of the region of the country in which the eligible unit resides. For the SSI program, participation is simulated using a complicated procedure which makes use of data on SSI recipients

---

1/See footnote on p. 10.

from the CPS survey and the TRIM determined SSI eligible caseload. For General Assistance, only those units acknowledging receipt of Public Assistance payments on the CPS, but not selected by TRIM to participate in the SSI and AFDC programs, are selected to participate. Also, unlike the other programs, for General Assistance, the dollar value payments simulated by TRIM are ignored and are replaced by the reported amount contained in CPS.

Simulating participation in the Food Stamp program

The need for the development of participation rates for the Food Stamp program results from the fact that historically a significant proportion of the Food Stamp eligible population does not participate in the program. To develop these participation rates, known characteristics of participating Food Stamp households obtained from the FNS's September 1975 survey are compared with TRIM-simulated eligible households for the same period. The end result of the procedure is an array of 480 participation probabilities which vary as a function of household size, gross income, age of household head, receipt of public assistance, and simulated bonus value. The array of participation probabilities is used by the Food Stamp module to select participating households from the list of simulated eligibles.

OTHER FEATURES

Other features of TRIM include the generalized Income Maintenance Simulation module, (IMSIM) the TALLY computer program, and an optional output generation capability called SUMTAB.

The purpose of the IMSIM module is to provide TRIM with increased flexibility in simulating a wide range of welfare reform alternatives (e.g., negative income tax programs). The module simulates the tax and transfer program proposals in two steps. The first step involves creating the filing unit prescribed for the proposed tax or transfer program and the second step calculates the transfer payment. The IMSIM Module was designed so that a TRIM analyst (rather than a computer programmer) should be able to specify, in full, many of the programs and program alternatives without the assistance of a programmer. The output from this module is limited to the listing of five numbers for the program being simulated, the total

--number of categorically eligible filing units,

--number of categorically eligible persons,

--number of filing units receiving benefits,

--number of recipients, and

--program costs.

The TALLY routine permits a user to modify existing modules in TRIM when the desired modification cannot be achieved through the use of parameters. TALLY essentially allows the user to insert new computer coding, or change any existing computer coding to perform unique calculations. By handling a modification in this manner, no permanent change is made to TRIM, but rather the change is in effect only if the TALLY computer program is requested during simulation. The TALLY feature is currently being used in the H.I.S. version of TRIM, as an interim procedure, to prepare the TRIM data base for the Food Stamp module by simulating public assistance participation (i.e., SSI, AFDC, and General Assistance) and imputing Food Stamp countable assets to the data base among other purposes. Eventually all these functions will be performed by other parts of TRIM, and the TALLY feature will not be needed for this purpose.

The purpose of the SUMTAB feature is to provide TRIM with the capability to produce summary tables which indicate the distributional effects of the tax or transfer program being simulated. Any person or family characteristic, either computed by TRIM or contained in the original TRIM data base can be screened. For the specified characteristic, SUMTAB will produce a table by income class and family size, which contains the number of families or persons (both unweighted and weighted) with the characteristic and, if the characteristic has a dollar value (e.g., simulated AFDC benefits), the total dollar amount. Alternative definitions of income and the filing unit may be specified. For example, we used SUMTAB to tabulate by total income class and family size, the number of families within the earned income class, and the total earned income for the class. We also used the SUMTAB feature to tabulate, by total income and family size, the number of families and persons on the CPS data base that were designated as categorically eligible for the SSI program because of a disability.

CHAPTER 5

OUR CRITERIA FOR EVALUATING TRIM

For our purposes, model evaluation is the process of assessing a model in terms of its structure and data inputs in order to determine, with some level of confidence, whether or not the results produced by the model can be useful to policy analysts or decisionmakers. The process does not end there. Once a model is judged useful, it is necessary to identify and explain how it might best be used.

There are no universally accepted guidelines or procedures for evaluating models. Based on an extensive literature search, and on our past modeling experience, we have developed criteria which we feel form the nucleus for such an evaluation. They are identified and described in the sections below. These criteria are not definitive, and are not so intended. Since TRIM is a large-scale, computerized model, our criteria are directed at that type of model. Many of the criteria specified herein can be used to evaluate more general conceptual models.

Our experience and that of other investigators has revealed that many problems occur during the development and/or use of computerized models operating in a decisionmaking environment. Nevertheless, examples exist which show that models can contribute positively to the decisionmaking process in spite of the fact that such problems detract from the usefulness of the model.

Some problems include:

--The poor quality and/or lack of documentation made it difficult to understand the model's assumptions, uncertainties, and limitations as well as its capabilities.

--The model development effort lacked sufficient coordination between the developer and the user. The user did not participate in the planning of the model; thus, the model did not clearly reflect the user needs.

--Workable provisions for updating the model for future uses were not made; thus, the model soon began to produce outdated information.

--It was not possible to obtain the data needed to make the model function.

With these recurring problems in mind we have developed a set of criteria to assess the usefulness and appropriateness of a computer model. The criteria comprise what we believe to be a minimal set of general guidelines or procedures to follow when evaluating a model. However, a model must not be judged in the abstract only but with regard to its purpose and objectives, the manner in which it is being used, and other feasible alternative approaches. Each criteria must be viewed within this framework.

The criteria we developed concern:

--Model documentation.

--Computer program verification.

--Technical validity. 1/

--Operational validity.

--Dynamic validity.

--Usability.

Pertinent questions which address these criteria are shown in figure 6. The criteria are discussed in more detail in the following sections.

MODEL DOCUMENTATION

Computer documentation, as used in this report, is defined as information recorded during the design, development, and maintenance of computer applications to explain pertinent aspects of a data processing system--including purposes, methods, logic, relationships, capabilities, and limitations.

Computer model documentation is the principal instrument which allows people interested in a modeling effort--the user, the model developer, potential users, etc.--to communicate. Complete documentation is important to (1) insure that the model is thoroughly understood and can be operated and maintained in the present and the future and (2) facilitate evaluation of the model by a third party (i.e., someone other than the model developer or initial user) such as GAO.

1/See Schellenberger, Robert E., "Criteria for Assessing Model Validity for Managerial Purposes," Decision Sciences, Vol. 5, 1974 pp. 664-653.

FIGURE 6. GAO'S CRITERIA FOR EVALUATING TRIM

MODEL DOCUMENTATION

Is the computer model documentation sufficient to understand, use, and maintain the model?

COMPUTER PROGRAM VERIFICATION

Was the computer model adequately verified?

TECHNICAL VALIDITY

What are the fundamental assumptions made in the model?

OPERATIONAL VALIDITY

What effect do these assumptions have on the model's results?

DYNAMIC VALIDITY

Have adequate procedures been established to maintain the model over its life cycle?

USABILITY

Is the model usable by policy analysts/decision-makers?

The scope and content of the documentation effort should depend on the needs of potential users, the cost to prepare, the type of application, the model's sharing potential, frequency of use, longevity and stability of the model, and personnel considerations. 1/

COMPUTER PROGRAM VERIFICATION

Verification of a computer program attempts to insure that the program behaves as the developer intended. It can be thought of as the sum of two investigations: (1) determining whether or not the mathematical and logical description of the process being modeled, as represented in the comupter program, is appropriate and correct for the problem, and (2) determining if the computer program has been both fully checked for data processing (computational) consistency and has been debugged (i.e., errors in computer coding have been corrected).

It usually is not practical to perform the computer program verification during the evaluation of the model. However, the evaluator should attempt to determine the extent to which the model has been verified during its developmental process.

TECHNICAL VALIDITY

A model by its very nature is a simplified representation of the system it is designed to simulate. This simplification takes place by making assumptions such as including only the critical variables in the model or incorporating only the most important relationships in the model. Technical validity requires the identification of all divergences in model assumptions from perceived reality, as well as the identification of the validity of the data used by the model. Very little has been written on the process of identifying assumptions. It requires knowledge of mathematical and computer techniques as well as knowledge of the system being modeled.

An important aspect of technical validity is the validity of the data being used by the model. Validating data requires examining both the raw data collected for use by

---

1/A publication that addresses this area is Guidelines for Documentation of Computer Programs and Automated Data Systems, Federal Information Processing Standards Publications 38, U.S. Department of Commerce, National Bureau of Standards, February 1976.

the model and the structuring of the data so that it can be used by the model (i.e., collected data may be aggregated, redefined, or otherwise manipulated before it is used by the model). The term "garbage in-garbage out" has been coined to refer to the importance of valid data. If poor data is input to the model poor results are likely to be output by the model.

OPERATIONAL VALIDITY

Operational validity deals with the question of the importance of the divergences identified under technical validity during the use of the model in the actual, decision-making environment. It requires actually testing the model to determine how sensitive the model's output is to the divergences previously identified. It is not likely that for complex models the evaluator could test all model assumptions. In that case, the evaluator would develop a test plan which addresses what the evaluator feels are the most critical assumptions.

DYNAMIC VALIDITY

Dynamic validity is concerned with determining how the model will be maintained and modified so that it will continue to be as valid as possible, throughout its life cycle. This includes examining and determining the adequacy of the provisions for updating parameters and expanding the scope of the model when appropriate, as well as the provisions for reviewing the success of the model over time and making necessary modificiations. Up-to-date documentation is critical to the dynamic validity of the model.

USABILITY

A model must be accessible and usable in order for it to be used and useful. Aspects of this criterion are the ease of use of the model, the transferability of the model to another computer system, the availability of the data for the model, the simplicity or understandability of the model, the appropriationess of the model, the relevance to an important problem, and the costs in terms of both money and personnel resources to run the model.

OTHER CONSIDERATIONS

Several other considerations in evaluating computer models should be stated. The importance of these considerations will undoubtedly vary greatly between particular modeling

applications but their value to some evaluations can be substantial. These include the

--results of any independent assessments of the model which may have been conducted;

--attitude with respect to the model of the model users, decisionmakers, developers, or others with knowledge of the model; and

--impartiality of the organizational unit responsible for operating, maintaining, or modifying the model.

CHAPTER 6

OUR EVALUATION OF THE TRANSFER INCOME MODEL

It is important that the analytical tools used for policy analysis in the Federal Government be evaluated periodically to determine their predictive accuracy, usefulness, and effectiveness. Models lend themselves to evaluations since the relationships and assumptions of the model are specified and can be identified. However, such an identification is not an easy task especially when dealing with a model the size of TRIM.

To perform our evaluation, we applied the criteria developed in the previous chapter to TRIM. The major part of our effort was aimed at determining the critical assumptions and relationships within TRIM and the effect they have on the output of TRIM. In order to accomplish this, we

--interviewed the TRIM users and developers and others knowledgeable in this area;

--reviewed all the technical documentation supporting TRIM;

--reviewed a number of policy analysis reports containing TRIM-generated estimates;

--examined the TRIM computer programs themselves, frequently working through them line by line to identify exactly what they did, and how; and

--conducted approximately 100 tests on various TRIM modules.

The following sections describe our results.

THE ACCURACY OR RELIABILITY OF TRIM IS DIFFICULT TO DETERMINE

We feel it is very important to determine the accuracy of a model which is used for policy analysis. While the marksmanship of a gun enthusiast can be determined easily by measuring how close the shooter comes to hitting the target, such is not the case with TRIM. For many TRIM estimates the analogous target is not known. That is, TRIM is

used primarily to look at program alternatives; but because most of these program alternatives are never enacted, the target (that is, the actual effect of the alternative) is never known. Furthermore, even in the case of existing programs modeled by TRIM, the primary numbers TRIM estimates--the number of people eligible for a given transfer program and the associated costs--are difficult to substantiate due to the lack of administrative data.

Although we conducted a number of tests on TRIM, we were unable to determine the accuracy of the model to our satisfaction. However, the accuracy or reliability of TRIM estimates cannot be overlooked because of this lack of a well-defined target. In fact, this lack of a target increases the need to know the range of variability of the estimates generated by TRIM. The accuracy of TRIM's estimates is affected by the

--accuracy, completeness, and currentness of the data used by TRIM and

--accuracy of the assumptions and relationships made in TRIM in order to simulate the transfer programs.

While these points might appear to be distinct, they are, in fact, closely related. As will become apparent in the following sections, the adequacy of the data available for TRIM purposes, to a large extent, has guided the development of TRIM.

THE DATA AFFECT TRIM'S ESTIMATES

The data base is probably the most critical component of TRIM. In chapter 4 we identified a number of data bases that have been or are likely to be used by TRIM.

Each of these data bases results from a sample survey. Estimates obtained from sample survey data may differ somewhat from the figures that would have been obtained if one had data on every person rather than on a sample of persons. For this reason the Bureau of the Census describes estimates it makes on the Current Population Survey, for example, in terms of standard errors. These standard errors indicate the variations that occur by chance because a sample rather than the entire population is surveyed.

The above factor represents the initial source of variability in TRIM's estimates. However, TRIM's estimates,

based on these data, contain no similar indicator of variability. It seems clear that such an indicator is warranted.

The resulting data in any survey work are subject to errors of response in addition to the sampling variability. For example, in the Current Population Survey there are errors of underreporting, nonreporting, and misreporting of income data due to a number of reasons. This is another source of variability in TRIM's estimates.

Another source of variability in TRIM's estimates is that none of the currently available data bases contains the all requisite information for TRIM purposes. Also, as we observed in chapter 4, each of these data bases has specific strengths and weaknesses.

Another source of variability common to each of these surveys is due to the time necessary to publish their results. For example, consider the CPS which is recognized as the best repeated survey presently suitable as a data base for TRIM. The CPS survey results are available for TRIM purposes about a year after the survey is completed--making the income data from the CPS about 2 years old, and the demographic data at least 1 year out of date. Thus, even if the original CPS data were perfect, one would still have to make demographic and economic projections in order for TRIM to make program estimates for the current year.

HOW THE DATA SITUATION AFFECTS TRIM

In order for TRIM to simulate the welfare area given the available data, numerous assumptions must be made. These assumptions, in essence, attempt to account for the inaccuracies, incompleteness, and lack of currentness in the data.

TRIM accounts for data in several ways:

--Some data are added to the data base or adjusted through the data modification and aging procedures described in chapter 4.

--Other data are incorporated in the data base by making use of the results of other surveys, such as the Annual Household Survey of Food Stamp Recipients.

--TRIM procedures are developed to circumvent the data it cannot correct or obtain.

This is why we stated that TRIM development was guided by the available data.

In the following sections we demonstrate that the factors identified above affect the estimates made by TRIM. The specific examples we use relate to the

--underreporting of income in the CPS,

--difficulty in determining the appropriate tax and transfer program filing units,

--process of aging the data base,

--simulation of the asset test for the transfer programs, and

--simulation of participation in the transfer programs.

We conclude this section with our observations on the TRIM documentation, the system's dynamic validity, the adequacy of TRIM computer program verification procedures, and the usability of TRIM.

THE EFFECT OF INCOME UNDERREPORTING ON TRIM ESTIMATES

An income underreporting problem exists in all data bases used by TRIM although the severity of the underreporting varies by type of income. As we showed in table 1, all types of income are underreported on the CPS although interest, rent, and dividend income is more severely underreported. The data modification procedures available in TRIM to correct for income underreporting are admittedly crude, due to data limitations, and are rarely used. Consequently, TRIM simulations of most programs ignore the income underreporting problem although we found that it does have a significant effect on TRIM results.

This effect can be illustrated easily by a Food Stamp program example, since the Food Stamp module is the only module which makes adjustments for income underreporting. The adjustments do not correct the underreported income but rather eliminate households already determined to be

income eligible for the program on the assumption that, if they had reported income correctly, they would not have qualified. 1/

Several aspects of the procedure can be questioned. For example, to develop the table of probabilities used to eliminate households, use is made of the admittedly crude TRIM underreporting correction procedure which has not been validated. Also, income is not corrected for those families who remain eligible for the Food Stamp program. This latter fact should result in higher simulated benefits (i.e., bonus values) than would result if the income were corrected, since the purchase price of food stamps decreases as a participating household's income decreases.

However, the consideration of income underreporting in the Food Stamp module does illustrate the significance of the income underreporting problem on the TRIM estimates. In a contractor's report 2/, it was shown that by adjusting for income underreporting, in the manner described above, the TRIM estimates of Food Stamp eligible households were reduced by almost 10 percent. Since the other programs modeled in TRIM should be affected by the income underreporting, similarly, those estimates should be high also.

Moreover, since Food Stamp program eligibility is partially linked to participation in the public assistance program, inaccurate estimates in the public assistance modules also will further affect the Food Stamp module results. Another effect of the income underreporting problem will be demonstrated in the section describing our tests of TRIM's transfer program asset test simulation procedures.

ALTERNATIVE PROCEDURES USED TO DETERMINE THE APPROPRIATE TAX AND TRANSFER PROGRAM FILING UNITS PRODUCE SIGNIFICANTLY DIFFERENT ESTIMATES

In chapter 4 we pointed out that an important function of the data modification procedures is the determination of the filing status of individuals and family members for the

---

1/See p. 51 for a more detailed explanation.

2/H. Beebout, et al., The Impact of the Resources Test and Survey Income Underreporting on the Food Stamp Eligibility Estimates, Mathematica, Inc., Jan. 1976.

tax or transfer programs. For example, this function determines the tax filing status of an individual and whether the individual is categorically eligible (and for what reason) for Supplemental Security Income benefits. This process is not straightforward. For example, information on disability and blindness necessary to identify these two target groups for the SSI program is not adequate in the CPS data base. Similarly, not all information needed to determine tax filing status of an individual is contained in the data base. Consequently more assumptions must be made.

The most profound effect of these assumptions occurs in the determination of public assistance program categorical eligibility, particularly for the SSI program. Two different procedures are used (i.e., different assumptions are made) to determine public assistance program categorical eligibility depending on the version of TRIM being used for the analysis. Each procedure uses different data to make its determination. Although one procedure is easier to follow, we found no reason to favor one procedure over the other, since administrative data are not available to support either procedure. Table 2 shows that there are marked differences in the number of records on the CPS data base classified as categorically eligible for the SSI program resulting from the two procedures.

This in turn causes a considerable variation in the TRIM Public Assistance module estimates of the SSI program costs and caseloads with respect to eligibles as shown in table 3.

TABLE 2. EFFECT OF FILING UNIT DEFINITIONS ON THE NUMBER OF UNITS CLASSIFIED AS CATEGORICALLY ELIGIBLE FOR TRANSFER PROGRAMS USING TWO DEFINITIONS

FILING UNIT CATEGORICALLY ELIGIBLE FOR	A	B	PERCENTAGE CHANGE
AFDC	5,879	5,602	- 4.7
GENERAL ASSISTANCE	20,301	21,752	7.1
SSI DUE TO			
AGE	10,489	9,838	-6.2
DISABILITY	2,416	810	-66.5
BLINDNESS (note a)	–	–	–
DIFFERENT REASONS (COUPLE)	158	23	-85.4
TOTAL SSI	13,063	10,671	-18.3

[a]There is no information on blindness on the CPS.

TABLE 3. VARIATION IN CASELOADS AND COSTS ARISING FROM TWO DIFFERENT DEFINITIONS OF FILING UNITS (note a)

FILING UNIT CATEGORICALLY ELIGIBLE FOR	A		B		PERCENTAGE CHANGE	
	NUMBER OF UNITS	PROGRAM COSTS (000,000 Omitted)	NUMBER OF UNITS	PROGRAM COSTS (000,000 Omitted)	NUMBER OF UNITS	PROGRAM COSTS
AFDC	3,098	$10,538	2,988	$10,032	- 3.5	- 4.8
GENERAL ASSISTANCE	2,471	4,620	2,857	5,405	+15.6	17.0
SSI DUE TO:						
AGE	3,037	5,056	2,820	4,636	- 7.1	- 8.3
DISABILITY	1,372	3,587	440	1,124	-67.9	-68.6
BLINDNESS (note b)	—	—	—	—	—	—
DIFFERENT REASONS (COUPLE)	53	107	8	21	-84.9	-80.3
TOTAL	4,462	$ 8,750	3,268	$ 5,781	-26.7	-33.9

[a] Filing unit numbers are unweighted; program costs are weighted.

[b] There is no information on blindness on the CPS.

Observe that simulated costs and caseloads for the SSI program vary significantly depending on the procedure used. This raises considerable doubt as to TRIM's ability to simulate adequately the eligible costs and caseloads for the SSI program.

AGING THE DATA BASE AFFECTS TRIM ESTIMATES

An essential characteristic of TRIM, if it is to provide reliable estimates, is the ability to accurately project (or age) a data base to represent some year other than the survey year of the data (e.g., project the 1975 CPS to represent 1978). Most TRIM simulations are performed in order to obtain estimates of the cost of, and number of persons benefitting from, existing and proposed transfer programs. However, the most current data available to TRIM are usually 1 to 2 years old, at best, so that a data projection capability is essential.

Practically every TRIM user we interviewed expressed concern about TRIM's ability to project a data base accurately. To the best of our knowledge only one attempt has been made to address this issue. 1/

The report concluded that:

--The aging process generally accounted for only a small percent of the variation in TRIM estimates of transfer program costs and caseloads but the variation increased the further into the future the data base was aged.

--Further sensitivity testing of the aging process should be done.

--Further work to develop better aging procedures should continue.

Following the suggestion made in the second conclusion we ran tests on TRIM using more recent data, including the recently developing aging procedures. Based on our tests, the aging process can significantly affect the results of TRIM, particularly concerning income distributional aspects. However, one of the recently developed aging procedures seemed to perform better than the other procedures.

1/H. Beebout, Transfer Income Cost and Coverage Projections - A Comparison Four Static Microsimulation Aging Techniques, Mathematica Inc., May 1974.

Our tests were aimed at determining the effect the aging process had on the data base itself and estimates made by TRIM. To determine these effects we projected out the March 1973 Current Population Survey data base 2 years using several of the TRIM aging options. We decided to age the data base 2 years because we felt that most simulations would require at least this amount of aging because at present, the March 1975 data base must be used to simulate the current year, 1977. We than used these several data bases and the actual March 1975 CPS data base as input to TRIM and compared the output. The results of our tests are summarized below.

How the aging process affects the data base

The aging process adjusts both the sample weights attached to each household and person record on the data base and the income associated with these records. The results presented demonstrate how the aging process affects the

--total number of households, families, persons, and children on the data base and

--income distributional makeup of the data base.

Table 4 compares the summary totals of the number of household, families, persons, and children contained in the file after aging with the comparable unaged March 1975 CPS figures.

TABLE 4. COMPARISON OF ESTIMATES FROM FOUR AGING OPTIONS WITH UNAGED 1975 CPS

TYPE OF UNIT	1973 CPS AGED TO 1975 (000 Omitted)				1975 CPS (000 Omitted)
	A (note a)	B (note b)	C (note c)	D (note d)	
HOUSEHOLDS	69,954	71,165	71,381	71,584	71,434
FAMILIES	73,994	75,391	75,474	75,682	75,944
TOTAL PERSONS	210,138	211,534	206,586	209,524	209,622
CHILDREN	52,700	52,700	50,117	49,615	49,610

[a] Column A estimates result from using democraphic aging option 1 (D1). (See figure 6.)
[b] Column B demographic aging option 2 (D2).
[c] Column C demographic aging option 4 (D4)
[d] Column D demographic aging option 5 (D5).

Note that each of the earlier developed procedures overestimates the number of children relative to the March 1975 CPS by as much as 6 percent. The more recently developed procedures come closest to the correct children total, but one of them did the poorest in estimating the total person population. Since this particular newer procedure was supposed to be superior to the earlier methods, this fact concerned us. We determined that this was due to the three-step process this procedure used to make its adjustments. (See p. 38.) The final step of the process, while successfully reducing the number of children, had the secondary effect of reducing the total number of persons. By its design, the D5 procedure could not act in this manner, and consequently seemed to produce the best results.

Table 5 compares the income distributional characteristics of the aged data bases with those of the March 1975 CPS data base. Casual inspection of this table might lead the reader to the conclusion that the observed variations in percentages are slight. From another point of view this is false. Each of these sets of numbers provides an estimate of the number of families falling into each of the indicated income categories. It is reasonable to view each set as an independent estimate of the same underlying population and ask the more precise question, "What is the probability that any two of these samples are selected from the same underlying population?" It turns out that the probability of this event is less than .001, i.e., less than 1 time in 1,000 would any 2 of these sets of data come from the same population and still have as large a variation as is displayed in table 5 due to chance alone. In other words, it is extremely unlikely that these sets can be considered to represent the same underlying population. The question naturally arises, "If they are all different, then which one, if any, is the best of estimates?" Of course, there is no way to tell. Since microsimulation, in general, and TRIM, in particular is identified as a tool useful for examining the income distributional effects of alterntive transfer program proposals; this could be a serious shortcoming. 1/

1/However, the income distributional data in column one may be misleading. The economic aging done in conjunction with D5 attempted to adjust for the known problems in reported CPS unearned income which is not reflected in this table. Consequently, the results might be more accurate than the actual 1975 CPS.

TABLE 5. COMPARISON OF THE INCOME DISTRIBUTIONAL EFFECTS OF THREE TRIM AGING OPTIONS WITH THE UNAGED 1975 CPS

FAMILY-EARNED INCOME	A (note a)		B (note b)		C (note c)		D (note d)	
	NUMBER OF FAMILIES (000 Omitted)	CUMULATIVE PERCENT	NUMBER OF FAMILIES (000 Omitted)	CUMULATIVE PERCENT	NUMBER OF FAMILIES (000 Omitted)	CUMULATIVE PERCENT	NUMBER OF FAMILIES (000 Omitted)	CUMULATIVE PERCENT
Less than 2,000	18,778	25.3	19,435	26.2	18,211	24.5	18,919	25.4
2,000 to 3,999	4,363	31.2	4,598	32.4	4,301	30.3	4,484	31.4
4,000 to 5,999	5,023	38.0	5,255	39.4	4,368	36.1	5,085	38.2
6,000 to 7,999	5,901	46.0	6,006	47.5	5,692	43.8	5,524	45.6
8,000 to 9,999	5,880	53.9	5,957	55.6	5,900	51.7	5,940	53.6
10,000 to 11,999	6,479	62.7	6,458	64.2	5,558	59.2	5,974	61.6
12,000 to 14,999	8,214	73.7	7,908	74.9	8,707	70.9	8,141	72.5
15,000 to 19,999	9,439	86.5	9,209	87.3	10,031	84.4	9,734	85.5
20,000 to 24,999	4,942	93.2	4,622	93.5	5,551	91.9	5,356	92.7
25,000 or more	5,074	100.0	4,808	100.0	6,058	100.0	5,432	100.0
TOTALS	74,093		74,256		74,377		74,589	

[a]Estimates from the 1973 CPS aged to 1975 by demographic aging option 2 and economic aging option 1. (D2, E1).
[b]Estimates from the 1973 CPS aged to 1975 by demographic aging option 4 and economic aging option 3 (D4, E3).
[c]Estimates from the 1973 CPS aged to 1975 by POPAGE and economic aging option 1 (D5, E1).
[d]The unaged 1975 CPS.

How the aging process affects the tax and transfer program estimates

The effects the aging process can have on estimating the eligible caseload and associated costs for the various tax and transfer programs are shown in tables 6 and 7, respectively.

TABLE 6. COMPARISON OF ELIGIBLE CASELOAD ESTIMATES (000 Omitted)

PROGRAM	A (note a)	B (note b)	C (note c)	UNAGED 1975 CPS
FEDERAL TAXES	59,726	60,848	62,051	62,756
SSI	5,207	5,369	5,711	5,216
AFDC	4,422	4,511	4,506	4,913
GENERAL ASSISTANCE	5,801	5,901	6,034	4,711
FOOD STAMPS	12,454	12,456	11,956	12,512

[a]D1, E2
[b]D2, E1
[c]D5, E1

TABLE 7. COMPARISON OF ESTIMATED COSTS IF ENTIRE ELIGIBLE CASELOAD PARTICIPATES IN PROGRAM (000,000 Omitted)

PROGRAM	A (note a)	B (note b)	C (note c)	UNAGED 1975 CPS
FEDERAL TAXES	$110,079	$113,730	$124,830	$111,287
SSI	6,079	6,249	6,671	5,781
AFDC	9,071	9,288	8,992	10,032
GENERAL ASSISTANCE	7,397	7,453	7,401	5,405
FOOD STAMPS	9,564	9,443	8,780	9,836

[a]D1, E2
[b]D2, E1
[c]D5, E1

All of these estimates are eligibility estimates and not all eligibles participate in a program. Available administrative data relates to participants in these programs. Thus, for the transfer programs in particular, the only comparisons we made are between the estimates resulting from the unaged 1975 data base and the several aged data bases from 1973 to 1975.

The obvious fact that can be inferred from these tables is that the tax and transfer program estimates vary depending upon the aging option selected. Also, each of the aging options provide results which differ from the TRIM estimates using the unaged 1975 CPS. Relative to the 1975 CPS eligibility, AFDC cost estimates were consistently low by about 10 percent. SSI estimates were consistently high by as much as 15 percent and Food Stamp estimates were consistently low. General assistance estimates diverged the most which highlights the admittedly weak capability TRIM has to simulate the General Assistance programs.

Since it is normally assumed that the participation rate of individuals in the Federal income tax program is high, we compared the aged TRIM estimates not only with the TRIM unaged results but also with Internal Revenue Service Statistics of Income data for calendar year 1974. This is the appropriate comparison because income data on the March 1975 CPS is for calendar year 1974. However, since the CPS data base is coded so that sources of income greater than $50,000 are reduced to $50,000, we made our comparisons only using Adjusted Gross Income classes below $50,000 (see table 8). While total individual tax receipts were approximately $123.3 billion in 1974, tax receipts from those with an AGI less than $50,000 were approximately $100 billion.

TABLE 8. COMPARISON OF FEDERAL TAX REVENUE ESTIMATES FOR TAX RETURNS WITH AGI LESS THAN $50,000

	A (note a)	B (note b)	C (note c)	UNAGED 1975 CPS	SOI DATA
FEDERAL TAXES (000,000 OMMITTED)	$92,568	$95,744	$104,558	$98,797	$100,151
AVERAGE TAXES PER RETURN AGI LESS THAN $50,000	1,570	1,590	1,700	1,590	1 510
AVERAGE TAXES PER RETURN ALL AGI INCOME CLASSES	1,840	1,870	2,010	1,770	1,840

[a]D1, E2
[b]D2, E1
[c]D5, E1

Note that if we made our comparison using all income classes (table 7), it would appear that column C was providing by far the best results when compared with actual tax revenues. However, if we ignore the highest income groups (table 8), each aging process provides estimates within about 5 percent of the actual revenues. Also note that the difference in the estimates among the aging options is as much as 10 percent and that column C estimates were the worst, based on average taxes per tax return. We feel these results further highlight the possible differences in the income distributional makeup of the data base resulting from the aging process. These examples also point out the difficulty in determining which aging process produces the "best" results.

DIFFERENT ASSUMPTIONS ARE MADE TO SIMULATE THE ASSET TEST FOR EACH TRANSFER PROGRAM

Asset data are not contained in the CPS data base. However, since an asset test provision is intended to be a major factor in the determination of eligibility for the SSI, AFDC, and Food Stamp programs, assumptions must be

made in order to simulate the asset test provisions of these programs. As we pointed out in chapter 4, to simulate the asset test for the:

--SSI program the assumption is made that the sum of interest, rent, and dividend income can be used to represent assets. Assuming a 6-percent rate of return, if the sum of this income exceeds $90 for a single person or $135 for couples--the eligible unit exceeds the $1,500 or $2,250 asset limit of the SSI program, respectively, and is not eligible for benefits.

--AFDC program a provision is made in the computer code to make an assumption similar to that of the SSI program. However, in practice, since the way the asset test is administered by each State varies considerably, most TRIM simulations of the AFDC program ignore this provision entirely and do not simulate an asset test.

--Food Stamp Program, rather than using an assumption like the one used for the SSI program, the asset data relevant to the Food Stamp program is imputed to the CPS file based on the asset data contained in the 1967 Survey of Economic Opportunity. Then the actual asset limits of the Food Stamp program are compared to the asset data of each household to determine whether the household's assets are within the limits prescribed by the programs.

Our initial observations on these assumptions were that:

--The assumptions made to simulate each program's asset test were different although similar assumptions could have been made for each program. In particular the Food Stamp asset test could have been implemented using a similar assumption to the SSI program and vice versa.

--Ignoring the asset test for AFDC program would have to result in overestimating the AFDC costs and caseloads.

--Since interest, rent, and dividend income are reported poorly on the CPS, using this data as a replacement for assets might be a poor assumption.

The results of our sensitivity tests on these assumptions are contained in tables 9 and 10.

TABLE 9. SENSITIVITY OF TRIM ESTIMATES TO CHANGES IN ASSET TEST FOR AFDC

ASSET TEST SCREEN	ELIGIBLE CASELOAD (000 Omitted)	ELIGIBLE BENEFIT COST (000,000 Omitted)
[a]$ 0	$ 4,479	$ 9,405
[b] 120	4,729	9,798
[c] 9999	4,913	10,032

[a]$0 asset screen means that a filer will be ineligible for the program is he has any interest, rent, or dividend income

[b]$120. asset screen represents the $2000. AFDC asset limit using the 6% assumption (i.e., $120 = (.06)($2000.)).

[c]A $9999. asset screen means that a filer will be ineligible only if the sum of his interest, rent, and dividend income exceeds $9999. This essentially simulates eliminating an asset test.

TABLE 10. SENSITIVITY OF TRIM ESTIMATES TO CHANGES IN ASSET TEST FOR SSI

ASSET TEST SCREEN		ELIGIBLE CASELOAD (000 Omitted)	ELIGIBLE BENEFIT COST (000,000 Omitted)
1 PERSON	2 PERSONS		
[a]$ 0	$ 0	4,710	$5,293
[b] 60	100	5,120	5,680
[c] 90	135	5,217	5,781
[d] 9999	9999	6,138	6,526

[a]$0 asset screen means that a filer will be ineligible for the program if he has any interest, rent, or dividend income.

[b]$60-$100 asset screen was used to try to account for the fact that interest, rent or dividend income are often under-reported (i.e., if a filer reported $60, he may have had $90 income from these sources).

[c]$90-$135 asset screen represents the $1500 and $2250 SSI asset limit under the 6% assumption (i.e., $90 = (.06) x ($1500) and $135 = (.06) x ($2250.)).

[d]A $9999 asset screen means that a filer will be ineligible only if the sum of his interest, rent and dividend income exceeds $9999. This essentially simulates eliminating an asset test.

These tables show that when the asset levels are set at extreme values (i.e., zero or 9,999) the change in caseload and benefit estimates was about 23 percent and 19 percent, respectively, for the SSI program; and 9 percent and 6 percent, respectively, for the AFDC program. To put these numbers in the proper perspective the percentage change is considerably less than that resulting from the previously described alternative implementations of the filing unit definitions in the case of the SSI program (see table 3); and about the same as that resulting from the aging process in the case of the AFDC program. (See table 7.) The point we are making is that other, nontransfe program-related factors, such as the aging process can have as much or more effect on the TRIM results as the actual change in pertinent transfer program parameters.

To determine the effect the TRIM Food Stamp program asset test procedure had on TRIM results we made use of a previously published TRIM report. 1/ The report identified that at one time the Food Stamp module ignored the Food Stamp program asset test requirement because of the lack of data. However, employing the asset test we described above rather than ignoring the asset test completely, resulted in a reduction of the Food Stamp eligible population by over 30 percent.

Based on these results the Food Stamp type of asset test has more of an effect on the Food Stamp program than the interest, rent, and dividend type of test has on the public assistance programs. This may be reasonable because of the specific characteristics of the particular programs; or it may be an incorrect conclusion resulting from the different types of assumptions used to simulate the asset tests. We cannot determine which of the above hypotheses is more reasonable. It is up to the knowledgeable policy analyst to make this determination. However, we feel this illustrates the importance of performing comprehensive sensitivity testing on TRIM assumptions, since without these test results an analyst would never know that such a determination must be made.

1/H. Beebout, et al., The Impact of the Resources Test and Survey Income Underreporting on Food Stamp Eligibility Estimates, Mathematica, Inc., Jan. 1976.

PROBLEM IN SIMULATING PARTICIPATION IN OTHER TRANSFER PROGRAMS

Earlier versions of TRIM were limited to making estimates of the eligibility to participate in a transfer program. The estimates would indicate the costs and caseloads of the transfer programs if everyone who was eligible participated in the program. The examples we have presented up to this point have concerned these eligibility estimates entirely. Recently, the model has been modified to make estimates of actual participation in the transfer programs. This work has stemmed from the development of the Food Stamp program and the interrelationships among the Food Stamp program and the SSI and AFDC programs.

The procedures used to simulate particpation in these programs vary. The method used to simulate the AFDC, SSI, and General Assistance programs is quite complicated but was briefly described on page 52. In short, for the AFDC program, the procedure relies on the TRIM-simulated eligibility estimates; for the General Assistance programs it ignores the TRIM estimates entirely in lieu of data reported on the CPS data base originally; and for the SSI program it uses both the TRIM estimates and the CPS reported information to identify participants. 1/ To simulate Food Stamp program participation, a table of participation probabilities based on TRIM Food Stamp eligibility estimates and on the characteristics of Food Stamp program participating households is used. The latter data are obtained from the September 1975 Annual Household Survey of Food Stamp Recipients.

We believe that the assumptions made in the participation simulation procedures for the AFDC, SSI, and General Assistance programs are highly subjective. The procedures seemed to be ad hoc processes aimed at matching some known level of participation in these programs without concerning themselves with why an individual chose to participate or not participate in the programs. As presently designed

---

1/The procedures used to simulate participation in these programs have been changed recently. However the new procedures had not been incorporated into TRIM at the time our review was completed. Thus, we did not evaluate the new procedures.

the procedures should be able to generate accurate estimates for existing programs for current or past years, since all the necessary data are available. On the other hand, any such procedure would be meaningless in evaluating wholesale revisions to these programs (since participation behavior might well change) or in estimating future year participation in the existing programs (since data for comparisons are not available).

The procedures do not take into account even the most obvious participation considerations. For example, they do not consider the amount of benefits an eligible family might receive if it participated--the higher the benefit, the more likely the family would choose to participate in the program. Also, based on our knowledge of the procedures, in order to use the alternative filing unit definitions described earlier, a considerably different procedure (with different assumptions as well as different participation rates) would have to be developed. As shown in table 11, using the procedure described above, the simulated participating caseload and associated costs for the SSI program vary considerably depending on the filing unit definition used.

TABLE 11. ESTIMATED CASELOADS AND COSTS FOR FY 1975 FOR TWO PROGRAMS USING TWO DIFFERENT DEFINITIONS OF FILING UNITS

PROGRAM	A		B	
	NUMBER OF UNITS (000 Omitted)	PROGRAM COSTS (000,000 Omitted)	NUMBER OF UNITS (000 Omitted)	PROGRAM COSTS (000,000 Omitted)
SSI (note a)	5,100	$7,200	4,135	$5,530
FOOD STAMPS (note b)	12,616	9,792	12,512	9,828

Note: Actual FY 1975 SSI costs were approx. $5.40 billion.
Actual FY 1975 SSI caseloads were approx. 4.10 million.
[a]Simulated participation for the SSI program.
[b]Simulated eligibility for the Food Stamp program.

As we previously mentioned neither definition was considered better than the other. However, after simulating participation, one definition clearly provides superior results. This occurs because the logic of the participation-simulating procedure and the participation rates used were developed, in part, based on the TRIM output resulting from using the definitions represented on the right hand side of the table. We feel that another procedure could have been developed based on the other filing unit definitions which would have made them look superior to the others. In fact, if the SIE data base is used in TRIM, an additional participation simulating scheme will be necessary.

The Food Stamp participation simulation procedure on the other hand does consider pertinent characteristics relating to Food Stamp participation, such as

--the amount of Food Stamp benefits the eligible household would receive (i.e., the bonus value),

--whether the household was receiving other public assistance,

--the household's size and gross income, and

--the age of the head of the household.

However, this procedure also must rely on the known output of the module to develop the table of participation probabilities. Consequently, the table of probabilities should be recalculated when a new data base is being used, a new aging procedure is developed, or the simulated transfer program is modified, but the basic procedure is not altered. Thus, although this procedure has limitations, in our opinion, it is definitely superior to the ad hoc procedure used to simulate SSI, AFDC, and General Assistance program participation.

OTHER CONSIDERATIONS

The previous sections of this chapter were intended to highlight how TRIM's estimates are affected by alternative assumptions. Our evaluation identified a number of other facts which deserve mentioning in this report:

--The State General Assistance programs actually are not simulated at all by TRIM. It is indicated in

the TRIM documentation that the model uses the AFDC rules and benefits to simulate the General Assistance program, since the specific details of the States' programs are too varied. However, since TRIM simulations show these results under the heading of General Assistance, the uninformed user might use these results incorrectly.

--All the tests described in this report concerning the effect aging the data base had on TRIM estimates dealt with aging the data 2 years. However, we also ran a number of tests aging the data 4 years. These results indicated that the variability in TRIM's estimates increases as the length of the forecast period increases.

--We are concerned with the model's limited ability to deal with unemployment rate-related analysis. TRIM's ability to adjust the unemployment rate is admitted to be a weakness in the system; but another unemployment rate issue which has received less attention should also be mentioned. The demographic aging process by adjusting the weights attached to each person's record has the potential unintended secondary effort of changing the unemployment rate imbedded in the data base. This may cause only a minor change in the actual unemployment rate on the file but the exact effect can only be determined once the demographic aging process is completed.

--At the time of our review TRIM did not include any capability to account for the behavioral response of the labor force to proposed changes in the structure and benefits of the transfer programs (i.e., the work incentive/disincentive issue). Thus, this aspect of a transfer program could not be simulated by TRIM. 1/

--Administrative aspects of the transfer programs are not addressed by TRIM. Consequently, proposals aimed specifically at streamlining administrative procedures and administrative costs cannot be simulated by TRIM.

1/The MATH version of TRIM now has such a capability. However, we did not test the MATH procedure and, therefore, cannot comment on its accuracy.

The remainder of this chapter discusses other aspects of our evaluation effort--the dynamic validity of TRIM, the adequacy of TRIM's documentation, the adequacy of TRIM's computer program verification procedures, and the usability of TRIM.

DYNAMIC VALIDITY

This aspect of model evaluation is particularly relevant to TRIM. TRIM has been evolving since 1968 and is continuing to change at the present time as existing transfer programs change, new programs are introduced, or programs not currently being modeled by TRIM are added to its capability. Not all these changes are being made to a single version of TRIM. If this trend continues it will become more and more difficult for congressional users (of the results of executive agency analyses based on TRIM) to know the assumptions upon which these analyses rely.

The TRIM User's Group is one vehicle that can be used to reduce this potential problem. At present the group serves primarily as a communicating device for the TRIM user community. Users discuss analyses they have conducted, problems they have had, or development work they intend to undertake. However, if the User's Group took more initiative over the development of the system and presentation of TRIM-produced results, this potential problem could be better controlled. For example, it is not at all evident, when reading a report containing TRIM-supported analysis, which version of TRIM has been used. If the group established ground rules for the presentation of TRIM-produced analysis so that the policy analyst or Government decisionmaker using these results is aware of the version of TRIM being used and the pertinent policy assumptions made, this problem could be better controlled. These ground rules could require that the version of TRIM being used for the analysis be clearly specified and that key methodological and policy related assumptions be identified. TRIM Ver-1, maintained at HEW, or some other version, could serve as the reference point to which other versions of TRIM are compared.

Another important aspect of dynamic validity--the maintenance of the model--obviously has been recognized by the TRIM User's Group, as evidenced by the maintenance contract for the system which the group funds. However, as the versions of the system become more different over time, reliance on a centralized maintenance contract will not be sufficient to insure that each version is current. Each

user who operates a version of TRIM on its own computer system will have to establish its own maintenance procedures, especially for those portions which are unique to its version of TRIM. For example only TRIM Ver-1 is maintained as part of the maintenance contract; but TRIM Ver-1 modules differ from those of the other TRIM versions. However, our review did identify that agencies or contractors that have a version of TRIM on their own computer system have strived to maintain the model adequately.

TRIM DOCUMENTATION

Another aspect of dynamic validity concerns the currency and adequacy of the documentation for the model. Our previous reviews in the area of computer model development have found that a recurring problem in these developmental efforts is the failure to prepare adequate documentation to support the model. This poor or incomplete documentation has reduced the usefulness of these models, made it difficult to modify the models, and limited the ability of others to understand or evaluate the models' capabilities.

There was more documentation supporting TRIM than we have experienced in other modeling efforts. However, the documentation was not completely up-to-date, and there was a lack of documentation on some aspects of the model development effort. It is quite common in model development efforts that the formal documentation for a computer program lags behind the implementation of the computer program. However, that does cause problems in trying to use and evaluate the computer program. For example, for our evaluation of the Food Stamp and Public Assistance modules contained in the H.I.S. version of TRIM, we had to rely entirely on piecemeal technical notes and the actual computer code. Fortunately these modules were computer coded with numerous comments interspersed among the computer logic, thus permitting our analysts to follow the logic of the procedures without much difficulty.

To determine the completeness of the TRIM documentation, we attempted to compare it against computer documentation guidelines recently published by the National Bureau of Standards in Guidelines for Documentation of Computer Programs and Automated Data Systems, Federal Information Processing Standards Publication 38. We recognize that these are merely guidelines and are subject to various interpretations and special considerations, but we feel they represent a reasonable approach to computer documentation.

Based on these guidelines the documentation falls short in the areas of program maintenance and test analysis. The guidelines suggest, and we concur, that the documentation should include a description of the program maintenance procedures associated with the computer program. In the case of TRIM, as we described in the previous section, good program maintenance provisions are especially critical to TRIM's dynamic validity. The guidelines also suggest that the results of test analyses of the computer model should also be contained in the computer documentation. The formal TRIM documentation is reasonably objective about identifying weaknesses and limitations in TRIM. However, only rarely are test results included that give the analyst an indication of how these limitations affect the models' results. Also, the TRIM documentation does not include either a test plan or test results that indicate the model had been verified and validated or had undergone any sensitivity testing. We feel that in a modeling effort the size of TRIM, such information is essential and should be documented.

COMPUTER PROGRAM VERIFICATION

As we pointed out in chapter 5, computer program verification is the responsibility of the model developers, and a model evaluator should determine the extent to which this verification had been performed by the model developers. It was apparent to us, as we conducted our evaluation, that verification procedures were deficient during the initial years of TRIM development. TRIM users acknowledged that errors in computer coding have existed in various TRIM modules. In fact, one task of the current TRIM maintenance contract is concerned with correcting and reporting errors which are uncovered by TRIM users.

During our testing of TRIM, for example, we uncovered a computer coding error in one of the demographic aging procedures which we brought to the attention of HEW and the maintenance contractor. We uncovered the error as we were routinely hand calculating some aging multipliers and found that the hand-calculated multipliers did not agree with the values output by TRIM. This procedure is a commonly used verification technique known as "desk-checking" and apparently was not done in this instance. Also, another aging option apparently is not performing as the developer had intended. This again indicates insufficient verification procedures. It is quite possible that similar errors exist in other parts of TRIM, particularly in the earlier developed and infrequently used modules. HEW has informed us that they

do not intend to verify these earlier modules now but do intend to extensively test any new TRIM modules or modifications to existing modules.

Although it does not identify any formalized verification procedures, the existing TRIM maintenance contract contains several provisions which could improve the TRIM computer program verification process. We feel that these provisions should have been routinely considered and implemented at the outset of TRIM development. For example, to verify a computer program, one needs test data files that

--contain a representative set of data records TRIM is likely to process, including unusual cases, so that programming specifications for TRIM modules can take these into account and

--are sufficient to exercise all logical paths in existing TRIM modules so that satisfactory tests of these modules can be performed.

Such test data files are only now being developed for TRIM. However, the test files will be worthless unless used appropriately. This would involve developing formalized verification procedures which are carefully documented and routinely applied to all TRIM developmental efforts.

USABILITY OF THE TRANSFER INCOME MODEL

We identified in chapter 5 that a computer model, if it is to be useful for policy analysis, should be accessible and usable. Some characteristics of accessibility and usability included the ease of use of the model, its transferability to other computers, and the costs to develop and use the model in terms of both money and personnel.

TRIM is difficult to use

To simulate a transfer program using TRIM requires specifying a considerable amount of input data, at the least making sure that the default values 1/ are appropriate for a particular simulation. Some of this input data is not specifically related to a given transfer program (i.e., data other

---

1/The default value for input variable is a value stored in the computer which is used unless the user specifies some other value on an input card.

than benefit tables, and asset and income limits, etc.). For example, some data input for Food Stamp program simulations are used to make various adjustments to other input data, to speed up the computer processing within the module, and to provide coefficients for regression equations used to impute Food Stamp countable assets. This makes the task of preparing for a TRIM simulation relatively complicated especially for someone other than an experienced TRIM analyst. We found this task particularly difficult at times, especially when we did not have adequate documentation to support a TRIM module. For example, on some of our tests, default values (which normally represent the existing values of a transfer program) had not been updated. As a result several of our tests had to be rerun with the correct data.

Also, we found that some of the nontransfer program-related input data could have a considerable impact on the TRIM results. Consequently, values for these input variables must be determined carefully. For example, one adjustment factor in the Food Stamp module had the effect of scaling TRIM results up or down in direct proportion to the value of the adjustment factor. That is, if the adjustment factor were decreased from 1.00 to 0.90, the TRIM Food Stamp estimates would decrease by 10 percent. In essence this adjustment factor could be used to generate any answer someone wanted for a Food Stamp program simulation.

We were also told that, for most simulations of alternative transfer program proposals, changes must be made in the actual computer code as well as changing input parameter values. Of course, it is not reasonable to expect that every possible alternative a policy analyst would want examined could be envisioned ahead of time and incorporated into the model's structure. However, whenever changes are required in the computer code of such a large model, errors are likely to occur. As a matter of fact, TRIM users are cautioned not to make changes without the aid of experienced TRIM programmer because the model is so complex with a large number of interdependencies.

Thus, in order to use TRIM effectively requires one or more

--policy analyst(s) knowledgeable in the program(s) being simulated,

--TRIM analyst(s) knowledgeable in the structure and inner workings of TRIM, and

--TRIM programmer(s) to make the necessary changes in the TRIM computer code and to run the model.

This, of course, is a considerable amount of personnel resources.

The costs to develop and use TRIM are substantial

In addition to the investment of staff needed to use TRIM, the staff costs to develop TRIM and the dollar costs to use TRIM are substantial. We were unable to obtain accurate estimates of the costs associated with the development of TRIM. However, one estimate we were given was between 30 and 50 staff-years. A rule of thumb which has been used in the Department of Defense for estimating programming costs suggests that the costs to design, flow chart, document, and test TRIM were likely to exceed 30 staff-years. This, however, does not take into account research efforts which were necessary to support development of TRIM. Consequently we feel tht the 50 staff-years estimate for the development of TRIM is possibly low.

The computer costs to run TRIM are substantial. Using the H.I.S. computer system, it required, at the least, 2 hours of computer processing time to make a complete pass through the TRIM module -from aging the data base to simulating the Food Stamp program--using the entire CPS data base. If the data base did not require aging, it still requires about 1-1/2 hours of computer processing time to simulate the tax, Public Assistance, and Food Stamp programs.

The relatively lengthy processing time and high computer costs have been attributed to the size of the data base and the inefficient or unnecessarily complicated computer coding. Efforts have been underway to make the computer code more efficient and to reduce the size of the data base by eliminating redundant data and aggregating data that currently is needlessly disaggregated. These and other efforts, for example, have led to a decrease in computer costs for TRIM simulations for the Food and Nutrition Service, by about one half.

We found the computer costs to be directly linked to the number of household and person records being processed. If only half of the records on the data base were used, costs would be reduced by one half. Since the SIE data

base is several times the size of the CPS data base, TRIM costs are likely to skyrocket when the SIE data base is used by TRIM. The TRIM contractors are trying to determine how to handle the large SIE data base. Some TRIM tests are now performed using a subset of the CPS data base, and perhaps a similar technique could be employed on the SIE. In any case, we feel more thought should be given to this entire area.

One alternative may be to develop a "two-tier" simulation capability. In a "two-tier" process, there is a lower level capability to produce "quick and dirty" results by using a much less detailed version of the model and only a subset of the data base. This "quick and dirty" capability affords the user the ability to obtain estimates, admittedly crude, of the effects of a large number of program variations in a comparatively short time and at a relatively low cost. Then, when a trend or pattern is determined, or when greater detail is desired for a particular example, the full model with the full data set is run. A dual approach such as this usually increases responsiveness and greatly reduces cost. This is particularly valuable in a model such as TRIM where both the model and the data base are large.

TRIM's transferability to other computers

Presently, TRIM is operational on IBM and UNIVAC computers. Although TRIM is programmed in the widely used FORTRAN programming language, the version of FORTRAN used on each computer is somewhat different. One result of this has been that Treasury's newly developed tax module has not been adopted by other TRIM users presumably because of the costs required to reprogram the module so that it could be used on an IBM computer. If this situation is ignored as time goes on, the incompatability between the IBM and UNIVAC versions of TRIM will grow and/or major duplication of effort will result.

We recognize that certain aspects of the TRIM modules, particularly the handling of data input and output, to be done efficiently, requires using a computer code specific to the particular computer system. However, we concur with a recent contractor's report which suggests that a standard version of TRIM written in FORTRAN, usable on several computers, could be developed without sacrificing accuracy of

TRIM's calculations. 1/ Such a development would facilitate the maintenance of TRIM, reduce duplication of effort, and have the potential to reduce the number of versions of TRIM that now exist.

1/Chow, G. and Hendericks, G., Maintenance on a Microsimulation Model on Multiple Host Computers: Alternative Strategies for TRIM, the Urban Institute, Dec. 1976.

CHAPTER 7

CONCLUSIONS, RECOMMENDATIONS, AND AGENCY/CONTRACTOR COMMENTS

We recognize that, given the complexity of the welfare issue and the pressing need to analyze the issue area, modeling is a valuable, and in some cases, necessary tool to perform the needed analyses. The speed with which a computer model can provide estimates of a number of alternative proposals and the detail with which a model can represent a system or issue, naturally make a good computer model a desirable tool for a decisionmaker to have at his disposal.

However, practically speaking, no model is or can be designed to analyze every aspect of a complex issue. A computer model should be used only to analyze those aspects of an issue it was designed to address. The application of a model to other issues should be undertaken only after considering the limitations inherent to the model. In any event, a model should be evaluated carefully prior to its use.

In the case of TRIM, our evaluation identified a number of factors that should be taken into consideration by a policy analyst/decisionmaker before he uses estimates generated by TRIM. Specifically our evaluation identified that:

--A number of versions of the model exist, and each version of the model has been undergoing significant modifications. This makes it difficult to determine which version or what modification of the model has been used by an executive agency for a particular policy analysis. This situation also increases the possibility that agencies using different versions of the model will make different estimates of the costs, impacts, and benefits of the same proposal.

--Because no currently available data source contains all the requisite information for analyzing welfare issues, assumptions are made in the model to compensate for the lack of accuracy, completeness, and currentness of the available data. These assumptions affect the estimates make by the model.

--Other assumptions made in the model concern critical transfer program characteristics such as determining the categorical eligibility for a transfer program, implementing a transfer program's asset test, and

estimating participation in a transfer program. These assumptions also affect the estimates made by the model.

--Documentation supporting the model, although containing most of the information we feel is necessary, lacks information on the results of validation and sensitivity tests of the model and has not been updated to contain the most recent revisions to the model.

--There are some errors in the computer code which indicated that there was inadequate verification of the computer model during its development.

--The model is difficult to use and requires a considerable investment of staff and computer resources to use it effectively.

During our evaluation it became apparent for many reasons, such as those cited above, that a policy analyst/decisionmaker should use TRIM very cautiously. Our analysis indicates, for example, that TRIM estimates are subject to considerable uncertainty. This raises questions concerning the way TRIM should be used. Based upon our evaluation, we conclude that:

--If used cautiously, giving adequate consideration to such factors as identified above, TRIM could be used to assess the relative impact or change in the eligible caseloads, associated dollar costs, and income-distributional effects of (1) existing tax and transfer programs, (2) modifications to these programs, or (3) proposed programs of this type. That is, we feel TRIM could be used to provide estimates which are sufficiently accurate to address such questions as:

  --What will be the percent change between 1977 and 1980 in the eligible population and associated costs for a given program if the program remains the same?

  --What will be the percent change in the eligible population and associated costs for a given program if the program's rules or benefits change?

  --Percentage-wise, how will a given income bracket be affected by changes in a transfer program or programs?

--Probably TRIM's greatest asset is its potential for examining how existing and proposed programs interact. Thus, used as a research tool, it appears to be well suited to the task of investigating the relative effect of wholesale changes in the welfare system provided that adequate data are available. Although the model would still exhibit the inaccuracies we have identified, it would reflect the interrelationships among the transfer programs. In this respect, it may provide estimates which are sufficiently accurate to address such questions as:

  --By what percentage does the change in rules or benefits of transfer program A affect the eligible caseload and associated costs in transfer program B?

  --What would be the percent change in the eligible caseloads and associated costs if the existing transfer programs were combined or eliminated and replaced by a single program?

--In general, TRIM should not be used provide absolute estimates of the eligible or participating caseload, associated dollar costs, and/or income distributional effects of the existing tax and transfer progams or proposed changes to these programs especially if no information is provided as to the uncertainty inherent in TRIM's estimates. That is, we feel TRIM cannot provide estimates which are sufficiently accurate to answer such questions as:

  --How much will a given program cost in 1977 or in 1980?

  --How many individuals will be eligible for, or will participate in, a given program in 1977 or in 1980?

  --By how much (in dollars) will a change in a given transfer program increase or decrease that program's costs?

  --What would be the dollar cost resulting from replacing the existing transfer programs with a single, new program?

--TRIM results should be used very cautiously for long-term projections (i.e., estimates beyond 4 or 5 years).

Analysts and decisionmakers often need absolute, not just relative, estimates of the impact of proposed program changes. Despite its limitations when used to develop absolute estimates, it may be necessary to use the Transfer Income Model for this purpose because there are no better alternatives. However, when considering its use for this purpose, it should be noted that TRIM-produced estimates are not accompanied by any information that indicates the uncertainty inherent in TRIM's estimates. Such information should be routinely provided and is particularly vital when TRIM is used for making absolute estimates.

RECOMMENDATIONS

We recommend the Secretary of Health, Education, and Welfare:

- --Reassess the adequacy of model and other analytical tools, including data bases, currently being used to support welfare policy analysis. This should include
  - --identifying the additional data needed to analyze welfare issues and obtaining this information on a consistent and continuing basis;
  - --identifying corrective measures needed to make the currently available analytical tools more effective and making necessary improvements;
  - --insuring that models in use are well documented, updated on a regular basis, and continually assessed as to the reliability and usefulness of their results; and
  - --on a periodic basis, performing a comprehensive study of the strengths and weaknesses of alternative types of welfare policy analytical tools, including a cost-effectiveness analysis, if possible.
- --Develop a plan for identifying and meeting future needs for analytical tools and data to support welfare policy analysis.

Executive Order No. 12013, dated October 7, 1977, transferred certain statistical policy functions from the Office of Management and Budget to the Department of Commerce. As part of its new responsibilities the Department of Commerce is planning to issue a Statistical Policy Handbook which

will include the guidance presently contained in the Office of Management and Budget Circular A-46, Standards and Guidelines for Federal Statistics.

Analyses of alternative policies and programs are placing an increasing reliance on the use of computer models and large data bases such as the sample surveys addressed in Circular A-46. Because of the generally increasing use of models to provide supporting data for these analyses and their close link to survey data, we recommend the Secretary of Commerce refine and extend the forthcoming Statistical Policy Handbook to specifically include guidelines for presenting results obtained through the use of such computer models.

AGENCY COMMENTS

HEW concurred with all but one of our recommendations and indicated ongoing activities within the Department which are directed at these recommendations. HEW did not concur with our recommendation to periodically perform a cost-effectiveness (or cost-benefit) study of the use of analytical tools for welfare policy analysis. While HEW agreed with the intent of the recommendation they questioned the appropriateness of a formal cost-effectiveness analysis because of the everchanging policy goals and analytical questions they are asked to address. We still feel strongly that the appropriateness of analytical tools should be reassessed periodically from a cost-effectiveness viewpoint. We recognize that policy issues change; this is why we recommend such reassessment studies be done periodically.

The Urban Institute was in general agreement with both the tone of the report and the conclusions. HEW and Mathematica Policy Research, Inc., took exception to our conclusion that, due to the variability inherent in TRIM-produced estimates, they should be used in the relative sense to indicate percentage differences of proposed program changes and not in the absolute sense to estimate dollar-budget impacts of these proposed changes. They indicated that, in a world of imperfect tools, TRIM or MATH, are superior to alternative methods of analysis for making estimates of the impact of proposed changes to welfare programs, including their budgetary impacts. We recognize that policymakers need budgetary impact estimates of program proposals and in some cases TRIM might very well be the best tool to make budget-type estimates. However, these estimates should be used with extreme caution and only if information indicating the uncertainty inherent in TRIM's estimates is provided.

Mathematica Policy Research, Inc., also stated that the current release of MATH is substantially different (an improved model) than the version of TRIM we describe in the report. They indicated a number of improvements which have been made or are being made to MATH which address deficiencies identified in this report. We evaluated the H.I.S. version of TRIM. H.I.S. attempts to maintain the most current version of TRIM which, at the time of our review, represented a version somewhere in between TRIM Ver-1 and the present MATH (see p. 4.). With the number of revisions being made to the system it is essentially impossible to evaluate the latest version. The revision to which the contractor refers may correct some of the deficiencies identified in this report, but we have not evaluated the revised model.

HEW and the TRIM/MATH contractors also provided some technical comments on the draft report which were considered in preparing the final report.

APPENDIX I

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

SEP 22 1977

Mr. Gregory J. Ahart
Director, Human Resources
Division
United States General
Accounting Office
Washington, D.C. 20548

Dear Mr. Ahart:

The Secretary asked that I respond to your request for our comments on your draft report entitled, "An Evaluation of the Transfer Income Model--TRIM." The enclosed comments represent the tentative position of the Department and are subject to reevaluation when the final version of this report is received.

We appreciate the opportunity to comment on this draft report before its publication.

Sincerely yours,

Thomas D. Morris
Inspector General

Enclosure

COMMENTS OF THE DEPARTMENT OF HEALTH, EDUCATION AND WELFARE ON THE GENERAL ACCOUNTING OFFICE DRAFT REPORT "AN EVALUATION OF THE TRANSFER INCOME MODEL--TRIM"

GENERAL COMMENTS

The draft report on the Transfer Income Model (TRIM) reasonably reviews and evaluates the TRIM microsimulation program and associated data bases. We generally accept the conclusions and recommendations included in the report and have implemented or are in the process of implementing many of the recommendations. We do not, however, concur with GAO'S conclusion (p. 136) that TRIM should not be used for budget estimation purposes for either existing tax and transfer programs or for proposed changes in these programs in present or future years.

Recognizing the high priority needs of policy makers for estimates of the impact of proposed changes in welfare programs including their budgetary impacts, we feel that microsimulation analysis, including TRIM, is superior to alternative methods of analysis, namely use of current program data or tabulated survey data. Program data are useful when the data available cover both the required population and the necessary data elements. Program data, however, are of little or no value when different populations are involved or the necessary data elements are missing. For example, the working poor today are only sporadically covered by our transfer programs, and it is difficult to know how program data could be used to estimate the impact of new programs covering this population. Use of tabulations from survey data also provide a means for estimating the costs of new or altered programs. This involves basically the same techniques that are used by microsimulation analysis, only the degree of precision is at question; and surely microsimulation analysis must be considered more accurate.

As the GAO report indicates, there are problems involved in estimating probable participation rates in new programs. There are both technical and forecasting problems involved in "aging" data bases. These problems make microsimulation estimates for future periods and for new programs less precise than one would like. Nevertheless, we feel that the TRIM methodology incorporates current knowledge in these areas, and is the most precise method available for making such estimates.

(2)

GAO RECOMMENDATION

—Reassess the adequacy of the analytical tools and data currently being used to support welfare policy analysis. This should include:

(1) —identifying the additional data needed to analyze welfare issues, and consider taking appropriate actions to obtain this information on a consistent and continuing basis.

DEPARTMENT COMMENT

We concur. Since October 1976, the Office of the Assistant Secretary for Planning and Evaluation (ASPE/HEW) has undertaken an Income Survey Development Program which is conducting an intensive research effort to determine the feasibility of developing a major new Survey of Income and Program Participation. The basic survey objectives, which target directly on the data needs identified in the GAO report, are:*

> The survey should allow for sophisticated analysis of Federal and State programs targeted at the low-income populations and should provide improved statistics on the distribution of income and wealth in the Nation, while preserving the flexibility to provide detailed data from time to time on related topics. The survey should be designed to provide data to support the analysis of the impact of Federal and State programs, and the estimation of future program costs and coverage and of the relative effects of program alternatives. This implies that the survey should be designed to provide information on the income, assets, and other social and economic characteristics of families and individuals eligible to participate in HEW and other Federal and State social programs under existing and proposed criteria. The survey should also permit separate analysis of those eligible but not participating in specific programs. Within the total set of program participants, separate estimates may be required for each of a number of key programs. It is also desirable to be able to obtain estimates of the joint receipt of benefits across programs.
>
> The survey should provide significantly better and more comprehensive income and income-related data than is presently available. The data should support estimates under a relatively broad notion of income or economic well-being while allowing for the aggregation of various components of income under a wide variety of income definitions utilized in the Federal and State programs and in existing Federal statistical series on income. Measures of income should coincide with the accounting periods used to determine eligibility under

*Source: Draft Research Plan for Income Survey Development Plan ASPE/HEW.

major Federal and State programs. Steps should be taken to reduce the extent of income underreporting and misreporting that exists in present income statistical series. The efforts to improve income measurement should deal with all sources of income and not be concentrated on the sources of income that only tend to be associated with the low-income population.

Present plans call for fielding a nationally representative Survey of Income and Program Participation in 1981. The long lead time required to field this survey results from the recognized difficulties in obtaining better data than is currently available and the need to make major improvements over current survey techniques.

The supplemental data obtained on the Survey of Income and Education (SIE) provides some additional information on assets, handicapping conditions and other categorical eligability criteria which will permit some immediate improvement over present practice. These items were added to the SIE with the requirements of microsimulation on the welfare system in mind. Limited space was available, since the basic purpose of this survey was to meet the requirements of the Congressional mandate in the Education Amendments of 1974. These additional data will be available sometime during the fall of this year.

GAO RECOMMENDATION

(2) --identifying corrective measures needed to make the currently available analytical tools more effective and consider taking appropriate actions to make these improvements.

DEPARTMENT COMMENT

We concur. HEW, and other major TRIM developers, are involved in a continuous process of improving the analytical tools used in TRIM. These efforts are conducted both by in-house ASPE/HEW staff, by other Federal Agencies (such as the Congressional Budget Office, Treasury Department, Agriculture Department, and the Federal Energy Administration) and by Mathematica Policy Research Inc., The Urban Institute and Sistemas Inc.. Through the TRIM User Group, and more informal daily contacts, improvements in analytical tools are shared.

Some recent improvements in the analytical tools used in TRIM which have increased its effectiveness are: the development of better ageing techniques; the development of the CPS/SIE TRIM Computational File; the development of an improved Federal Income Tax (FEDTAX) module, which is presently being further refined to provide better estimates of capital gains or losses and separate estimates of medical deductions; the development of test files employing extreme cases and the development of some techniques for simulating declir in unemployment rates.

TRIM analytical developments must respond to the constantly changing requirements of policy makers. Thus, a substantial effort is also devoted to adapting TRIM in response to changes in the types of welfare reform proposals being considered. A major recent activity has been the development of the capacity to simulate the impact of employment programs. We expect to continue this type of activity.

GAO RECOMMENDATION

(3) --on a periodic basis, performing a cost-effectiveness (or cost benefit) study of the use of analytical tools for welfare policy analysis.

DEPARTMENT COMMENT

We do not concur. Although we agree with the intent of this recommendation, we question the appropriateness of a formal cost-effectiveness or cost benefit analysis because of the ever changing policy goals and analytic questions TRIM is asked to address. Cost benefit (or effectiveness) analysis appears more appropriate when evaluating the consequences of using differing policy tools to meet a fixed policy goal. ASPE/HEW furthermore does not review the activities of other Federal Agencies. We do, as part of the annual budget process, attempt to review the returns to our TRIM contracts and in-house activities. In addition, we are continually attempting to make TRIM a more efficient and less expensive tool for policy analysis. Finally, we are constantly searching for additional techniques to improve our analysis.

GAO RECOMMENDATION

(4) --insuring that the models currently being used for welfare policy analysis are well documented, updated on a regular basis, and continually assessed as to the reliability and usefulness of their results.

DEPARTMENT COMMENT

We concur. ASPE/HEW has provided major funding for the TRIM Maintenance Contract (Urban Institute) which provides a well documented and regularly updated standard public use version of TRIM. Version 2 of TRIM is currently being developed under this contract. As part of this effort, the associated TRIM documentation is also being substantially revised. At present, the development and documentation of a new standard version of TRIM tends to lag about three to six months behind developmental efforts. Given the magnitude of the programming and associated documentation efforts required, the current, high priority Presidential Welfare Reform Initiative, and constraints on staff time; major reductions in this lead time are not presently feasible. In order to facilitiate the use of improved TRIM analytical tools, extensive use is made of comment cards in developing computer code and there is close contact among the TRIM staff in various organizations through the TRIM User Group and more informal communications.

APPENDIX I

(5)

The reliability and usefulness of TRIM results are routinely evaluated. The maintenance contract provides for the evaluation of all modifications and new procedures incorporated into TRIM. A special test file with known results is employed. These modifications and new procedures are also checked by comparing the results obtained from different versions of TRIM. Differences are determined and the reasons evaluated. In some cases, this results in further modifications. We feel that the existence of different versions of TRIM provides a significant tool for evaluating TRIM results, and that to fully eliminate such differences would attribute a reliability to the estimates which is more apparent than real. The TRIM Maintenance Contract further includes procedures for keeping up with administrative, legislative and regulatory changes so that the model may be modified accordingly.

Historical comparison is also used to evaluate the reliability and usefulness of the TRIM results. However, program changes are implemented regularly thereby limiting this type of analysis. Although results are routinely checked against administrative data, there are significant problems with this data and adjustments must be made in the reported figures which can produce other errors. Sensitivity analysis is employed in evaluating the results of proposed modifications to existing programs in order to determine their impact on overall program cost and caseload estimates and these findings are incorporated in TRIM reports. In some cases, further checking is impossible since the program changes have not been implemented. We expect to continue this regular assessment.

GAO RECOMMENDATION

—develop a plan for identifying and meeting future needs for analytical tools and data to support welfare policy analysis.

DEPARTMENT COMMENT

We concur. Several activities are currently employed in identifying and meeting future needs for analytical tools and data to support welfare policy analysis. The Income Survey Development Program has developed a long-term research plan for the development and fielding of a major new survey to provide improved data. The TRIM Maintenance Contract is one vehicle employed by HEW/ASPE to identify and insure the meeting of needs for both routine updates to the TRIM System, improve its functioning as a computer modeling system and incorporate new analytical techniques. Other Policy Research projects, including the Income Maintenance Experiments and the basic research of the Institute for Research on Poverty, support welfare policy analysis. In addition, there is an in-house ASPE program of improvements to the TRIM system. We also keep informed of the research agendas of other Federal Agencies and attempt to co-ordinate our efforts with theirs.

APPENDIX I

(6)

RECOMMENDATION

—Establish a reporting policy which requires that the assumptions and limitations of the analytical tools used to support policy analysis are clearly specified in Department reports to the Congress and that appropriate confidence limits are attached to the results presented therein.

DEPARTMENT COMMENT

We concur. ASPE/HEW believes that TRIM users should report their results clearly and should fully document the assumptions and limitations underlying their analysis. We have tried to meet these goals ourselves. See, for example, the TRIM analysis found in The Income Supplement Program (Office of Income Security Policy, ASPE/HEW, Summer 1977).

We also approve of attaching confidence limits to TRIM estimates whenever possible. The current state-of-the-art, however, often does not permit the development of reasonable confidence intervals. Although standard errors of estimate can be computed to account for sampling error, this standard error often represents only a small amount of the relevant confidence interval. Underreporting, misreporting and the lack of certain data, such as assets, impacts more heavily on the results than the standard error associated with the sample. Improving performance in these cases is dependent on the development of better data. A discussion of these limitations in the data is, of course, routinely included in reports.

APPENDIX I

THE URBAN INSTITUTE 2100 M STREET, N.W. WASHINGTON, D.C. 20037

September 19, 1977

Mr. Frank Capece
General Accounting Office
Room 5110 Arthur Building
441 G Street, N.W.
Washington, D.C. 20548

Dear Frank:

As a follow-up to Ron Sepanik's telephone call of some time ago, I thought I would send you a note concerning the GAO report on TRIM. Our staff has now completed reading it and we find ourselves in general agreement with both the tone of the paper and the conclusions. Ron, as you know, had some specific comments on it but I believe concurs with our general judgment.

I believe the paper should add to the knowledge of the usefulness and limitations of TRIM as a policy tool. It has always been my position that TRIM should not be oversold and one way to prevent this is to get more analysts involved in examining its structure and the inherent shortcomings of the data with which TRIM works.

In that light, Bob Harris, who is the Senior Vice-President here at The Institute, has recently completed a paper which provides an overview of the general utility of microsimulation in policy analysis. I thought you might be interested in reading through it.

Yours sincerely,

Dick Michel

Richard C. Michel
TRIM Project Manager

APPENDIX I

MATHEMATICA POLICY RESEARCH, Inc.
An Equal Opportunity Employer

August 22, 1977

Mr. Harry S. Havens
Director
Program Analysis Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Havens:

We have read your draft report to Congress and I have, with the assistance of Pat Doyle and Anne Bergsman, prepared a detailed set of comments. [See GAO note.]

We find that the report accurately describes the version 1 TRIM model and is a very useful piece of work. However, we want to emphasize that the current release of MATH is a substantially different and improved model. We are concerned that MATH is damned by association in the report. We also object to the dogmatic nature of the statement on page 136 of what the model should or should not be used for. Potential users should be cautioned, but in a world of imperfect tools may still find TRIM or MATH the best available tool.

One critical theme of the report was that the model did not have adequate testing and verification and that the documentation, while better than what existed for other models that GAO has evaluated, was lacking in a couple of areas. We would agree that the model did not have adequate testing and validation. Most of the funding, even during the early development period, was for specific policy estimates. Because of insufficient funding by the government, we had a desperate struggle to complete the model with the effort on the brink of default. The story has been the same ever since, with many agencies wanting to use the model for policy estimates, but with money for maintenance, documentation and improvement very difficult to obtain. This problem is much broader than this model. It is a product of the government procurement process which tends to award contracts to produce the minimum acceptable product.

GAO note: The detailed technical comments prepared by the contractor have not been included in this appendix. However, these comments were considered in preparing this report.

1101 L STREET, N.W. • SUITE 416 • WASHINGTON, D.C. 20037 • TELEPHONE: 202-833-9510 • TELEX: 843479 • CABLE ADDRESS: MATHINC
A Subsidiary of Mathematica, Inc.

APPENDIX I

This process is exacerbated when a public good used by many agencies is the product. Everyone wants to use the public good for free and few feel a responsibility to support its continued development and maintenance. The TRIM User's Group and the MATH Subscription are attempts to deal with the problem. However, they are only partial solutions at best. I would think this wider issue would be an excellent area for GAO study.

The opportunity to comment on your report is appreciated. Please don't hesitate to call if you want to pursue any of the questions we have raised.

Sincerely,

Harold Beebout
Vice President

APPENDIX II

LIST OF RELATED GAO REPORTS

"Food and Agriculture Models for Policy Analysis, "CED-77-87, July 13, 1977.

"Social Research and Development of Limited Use to National Policymakers," B-176765, HRD-77-34, April 14, 1977.

"Review of the 1974 Project Independence Evaluation System," B-178205, OPA-76-20, April 21, 1976.

"Ways to Improve Management of Federally Funded Computerized Models," B-115369, CED-77-87, August 23, 1976.

"Improvement Needed in Documenting Computer Systems" B-115369, Oct. 8, 1974.

"Auditing a Computer Model: A Case Study," May 1973.

"Advangtages and Limitations of Computer Simulation in Decisionmaking," B-163074, May 3, 1973.

APPENDIX III

PRINCIPAL HEW OFFICIALS RESPONSIBLE FOR ADMINISTERING ACTIVITIES DISCUSSED IN THIS REPORT

	Tenure of office	
	From	To
SECRETARY OF HEALTH, EDUCATION, AND WELFARE		
Joseph A. Califano, Jr.	Jan. 1977	Present
David Mathews	Aug. 1975	Jan. 1977
Caspar W. Weinberger	Feb. 1973	Aug. 1975
Frank C. Carlucci (acting)	Jan. 1973	Feb. 1973
Elliot L. Richardson	June 1970	Jan. 1973
ASSISTANT SECRETARY FOR PLANNING AND EVALUATION:		
Henry J. Aaron	Feb. 1977	Present
Gerald H. Britton (acting)	June 1977	Feb. 1977
William Morrill	June 1973	Jan. 1977
Stuart Altman (acting)	Apr. 1973	June 1973
Laurence E. Lynn	June 1971	Apr. 1973

(97132)