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Two Papers on a New SIPP-Based Microsimulation Model of SSI and OASDI:

Rationale for a SIPP-Based Microsimulation Model of SSI and OASDI

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Implementing an SSI Model Using the Survey of Income and Program Participation

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PREFACE

This Working Paper includes two interrelated papers presented at the annual meeting of the American Statistical Association in August, 1991. Both papers will appear in the 1991 Proceedings of the Social Statistics Section of the American Statistical Association; the versions published here have been amended slightly.

The papers outline the central ideas and the progress-to-date associated with the development of a new microsimulation model for program analysis at the Social Security Administration (SSA). The first paper, *Rationale for a SIPP-Based Microsimulation Model of SSI and OASDI,* relates the analytical potential of the proposed model to data development efforts intended to overcome specific information gaps. It also suggests areas in which the model can enrich SSA's ability to address issues specifically related to either the Supplemental Security Income (SSI) or Old Age, Survivors, and Disability Insurance (OASDI) programs or issues requiring comparative analysis of both programs. The second paper, *Implementing an SSI Model Using the Survey of Income and Program Participation*, describes progress on a preliminary version of the model focusing on the SSI program. It includes a brief description of the model, presentation and discussion of initial results, and comparisons to other studies.

The authors are grateful for the support Peggy S. Trout, Benjamin Bridges, Jr., and Selig Lesnoy have provided for this work. It should be noted that this work builds on past data development projects of SSA and the Bureau of the Census and that this project depends on a continuation of those efforts. The authors thank Benjamin Bridges, Jr., Selig Lesnoy, and Janice Olson for their helpful comments on the papers. The authors are also indebted to Linda DelBene, Henry Ezell, and Howard Oberheu for their valuable assistance in bringing the model to its current stage of development.

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RATIONALE FOR A SIPP-BASED MICROSIMULATION MODEL OF SSI AND OASDI

I. Introduction

When two public programs have objectives which overlap to some degree, analysts must evaluate the most target efficient way to address a given policy issue.[1] For example, the Social Security Administration (SSA) administers both a broadly-based social insurance program (Old Age, Survivors, and Disability Insurance or OASDI) and a means-tested program for the aged and disabled (Supplemental Security Income or SSI). Both SSI and certain provisions of the OASDI program have income adequacy objectives and, for example, either program could serve as a vehicle to address the needs of low-income elderly widows.

Comparative analysis would be useful because the principles underlying the two programs differ and, consequently, their "targeting" outcomes vary. There is a participation or "coverage" issue associated with SSI: Some of those with incomes low enough to receive benefits do not apply. The social insurance program, OASDI, poses another issue--even when specific provisions are intended to help those with low (past) earnings or low (current) income, some benefits due to the provision are likely to be received by those with moderate or high incomes.

These issues are well understood by analysts, but there has been no regularly-available source of data rich enough to support systematic distributional analysis. Neither program data nor survey data, taken alone, would suffice. However, as a result of two long-term development efforts, the required data now exist and the Social Security Administration is expanding its long-

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[1] By target efficiency we mean two things: Ensuring that all intended recipients receive benefits and that *only* intended recipients receive benefits.

standing activities in the area of microsimulation modeling to exploit them.[2] The data sources are the Survey of Income and Program Participation (SIPP), and matched SSA earnings and benefit data.[3]

This effort will enrich SSA's ability to address SSI and OASDI issues, taken alone, and permit comparative analysis. Within the federal government, no such model exists; indeed, because of the confidentiality issues surrounding the earnings and benefit data matched to the SIPP, in all likelihood an SSI/OASDI model of this type would only be developed at SSA.

This paper sets out the central ideas underlying the project in a nontechnical way. Section II describes the data sources. Section III discusses features of microsimulation modeling, the principal analytic technique to be used. Section IV considers possible contributions of the model with respect to SSI, OASDI, and issues which relate to both programs. The final section provides a summary.

II. The Data

Background

Several years ago, Nelson McClung, a prominent microsimulator, wrote:

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[2] Since the 1970's, SSA has used a microsimulation model, the STATS model, which uses data from the Current Population Survey. This effort is headed by David Pattison, under the general direction of Benjamin Bridges, Jr. For a nontechnical description, see Wixon, Bridges, and Pattison (1987).

[3] The SIPP-related matching activity at SSA has been undertaken as part of a joint statistical project between SSA and the Bureau of the Census under the aegis of the agencies' 1967 Memorandum of Agreement on the Exchange of Statistical Information and Services. All work involving the development and analysis of the matched data sets at SSA is carried out, subject to the strictest confidentiality safeguards, by SSA employees acting as special sworn employees of the Bureau of the Census. A match file for 1984 has been created; efforts are under way to produce matched data for later years. The analytical effort described in this paper is critically dependent on continuing efforts to produce future SIPP match files for policy research at SSA.

> Continued improvement in microsimulation depends mainly upon having better data. I do not want to discourage research on technique, but I suggest that research be more willing to conclude with specifications for a desirable data collection and less willing to press on to imaginative alternatives to better data.[4]

Any contribution made by the model outlined here will stem from two successful data development efforts. Each was designed to address a particular, well-recognized information gap:

- *There was no ongoing survey designed to support analysis of income maintenance programs, including, for example, the estimation of SSI participation rates.* The only regularly-available data used to estimate SSI participation rates were from the Current Population Survey (CPS), a survey designed to provide labor force statistics, not to support program analysis; it measured neither assets nor monthly income and had weak measures of disability.

To meet such needs, the Survey of Income and Program Participation (SIPP) was developed to support evaluations of a range of public programs, including means-tested programs. The survey, conducted by the Bureau of the Census, is nationally-representative, ongoing, and its data are now widely used.

- *Analysts using administrative data to evaluate changes in the OASDI program could not say to what extent the changes would affect those with low or high family income.* For example, administrative data do not tell us how proposed changes in OASDI affecting elderly widows would affect those with low family incomes, as opposed to those with higher incomes. While family income level is not relevant for all policy issues, for issues of income adequacy, it is.

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[4] See McClung, pages 105-106, in Orcutt et al., editors (1986).

In response, matching techniques have been used to combine survey data with earnings history data and benefit data from SSA administrative files. With match files, earnings data allow us to identify those affected by certain changes in OASDI, while survey data allow us to describe them in terms of their family income from all sources, assets, demographic traits, and household composition.

The Survey of Income and Program Participation

The SIPP is an ongoing, nationally-representative survey of the civilian noninstitutional population with information on income, assets, demographic traits, household characteristics, and participation in many programs. It was conceived in the seventies by experts who concluded that a survey specifically designed to support analysis of public programs was needed.

The Committee on National Statistics of the National Academy of Sciences recently released an interim assessment of the SIPP. Because of its reputation for objectivity and expertise, some of the Committee's findings are worth noting:

> Overall, the committee finds that SIPP is making a vital contribution to understanding the characteristics and dynamics of the population at economic risk, and the ways in which federal programs meet--or fail to meet--economic needs...
>
> One of the primary goals of SIPP is to meet the needs of policy analysts for information on families eligible for government income maintenance programs: how much use is being made of them; how well or poorly they are meeting their objectives; and what factors appear to influence entry and departure from them.[5]

These findings suggest the SIPP's multi-purpose rationale. First of all, information is collected on various dimensions of economic well-being. By comparison to the CPS, the SIPP has

[5] See pages ix and 1, Committee on National Statistics (1989).

improved income measures and comprehensive measures of assets, both of which are important for SSA policy research.[6] In addition, it collects the information needed to determine eligibility and benefits for many public programs, including monthly income (SSI and other programs use a monthly accounting period) and more detailed measures of disability than those in the CPS. The SIPP's monthly reference period, in contrast to the annual reference period of the CPS, offers analysts an opportunity to consider the dynamics of program participation, income flows, work behavior, and household composition. Furthermore, the data will support both cross-sectional and longitudinal analysis. On the one hand, the volume of information collected and the SIPP's multi-purpose design make it difficult to use and suggest the importance of developing expertise. On the other hand, we take the view that the acknowledged difficulty of using the SIPP is not an accident of poor design but rather an inevitable by-product of the SIPP's rich content and multi-purpose rationale.

As the SIPP is designed, a new sample panel is introduced each year. Because sample members are interviewed every four months for two and a half years, the panels overlap. Panels can be combined to increase the precision of estimates. The original panel size was 20,000 households, but this was reduced to 12,000 due to cuts in the Census Bureau's SIPP budget; however, the sample size has been restored to 20,000, beginning in 1990.

The SIPP also has limitations with respect to SSA policy research. For some applications, the sample size will limit the amount of subgroup analysis which can be reliably undertaken. Furthermore, while the questions on health are extensive, using the responses to those questions

[6] See Vaughan (1989).

to decide whether someone would be considered disabled in qualifying for public programs may be problematic.

Matched Earnings and Benefit Data

As part of an ongoing data development effort of the Bureau of the Census and SSA, SIPP data are matched to SSA data on earnings and benefits for the same individual. The earnings data are taken from SSA's Summary Earnings Record which is based on employers' reports of covered earnings from 1951 onward. OASDI data are extracted from the Master Beneficiary Record. Data on SSI benefits from the Supplemental Security Record will be included in future matching efforts. The use of these matched data is highly restricted due to confidentiality considerations.

The Three-Part Focus of the Data

The analytical effort outlined here will exploit three focal categories inherent in the matched SIPP data:

(1) evaluative variables, giving demographic characteristics and the dimensions of economic well-being;

(2) the elements of eligibility and benefit determination for major means-tested programs; and

(3) information on earnings histories and benefits--the elements of eligibility and benefit determination for OASDI.

While variables may fall in more than one category, the three categories, combined in a single analytical file, are central to the effort described here. They will permit analysis of some OASDI issues from an income adequacy perspective, as well as comparisons of SSI and OASDI alternatives with respect to issues of income adequacy.

III. Aspects of Microsimulation

A procedure for determining current law eligibility or the effects of an alternative benefit structure on eligibility, benefits, or behavior would have to be added to any data collection effort intended for rigorous program analysis. As the term is used here, a microsimulation model provides a way of relating data on individuals and households to program provisions for such purposes.

From a historical perspective, microsimulation models have provided a framework for incorporating data on individual persons and households into the distributional analysis of benefits and taxes. The enabling developments have been advances in hardware speed and software techniques (e.g., parameterization and modularity). As a result, microsimulation offers the promise of state of the art analysis in time frames once associated with "quick and dirty" estimates. What are some of the central features of microsimulation?

- *Microsimulation prevents the loss of information frequently associated with efforts to model program eligibility or the behavior of individuals with aggregated data.* The relationships that are modeled stem from program provisions (e.g., eligibility for benefits) and behavioral

responses to policy changes (e.g., decisions to apply for benefits).[7] The real world processes simulated, such as the determination of SSI eligibility, depend on *combinations* of traits of particular persons or families. Nonetheless, because disaggregated data are sometimes not available or because of the tight deadlines associated with policy discussions, estimates based on aggregated or group data are often used. But when only highly aggregated data are available, information on combinations of traits or joint distributions is often lost and assumptions must play a greater role.

The microsimulation approach is intended to avoid this loss of information. Under microsimulation the analytical process is designed to mirror the real world process. This begins with the design of the underlying data; the SIPP, for example, collects information at the level of persons and households and the information collected is determined, in part, by reference to the eligibility criteria of major public programs. The model then uses information on individuals and families on a case-by-case basis, taking each through an eligibility determination process which mimics the claims process itself.

- *Survey-based microsimulation models give policymakers an effective means of considering hypotheticals, such as: (1) the program eligibility of individuals who have never applied or (2) the eligibility, benefits, and behavioral responses associated with benefit structures which have been proposed, but not enacted.* One criterion for evaluating a means-tested program is how well it reaches its targeted population. The main complication is that

[7] Our initial efforts have involved modeling program provisions for SSI; see Vaughan and Wixon (1991). Relating data from a multi-purpose survey to these provisions is a major undertaking, for two reasons. First, the program provisions involve many steps and the SIPP data are rich enough that the model simulates most of the steps. Second, seldom do survey data exactly replicate the data collected during the benefit application process. The eligibility and benefit modules can serve as a platform for later work on program participation decisions, labor force responses, and projection.

nonparticipants within the targeted (or eligible) population are not represented in the program data. To address this issue, eligibility models are used in conjunction with surveys representing the general population, allowing analysts to estimate the number of eligibles and their hypothetical benefits.

In addition, the model's step by step representation of the eligibility and benefit determination procedures is analytically powerful. It allows us to consider "what if" alternatives to the current structure, including the effects of *particular* structural features (for example, the SSI asset test or the progressive design of the OASDI primary insurance amount or PIA) or parameters (such as SSI benefit standards).

• *Disaggregated data and microsimulation techniques permit flexibility in grouping persons within households and defining population subgroups. This flexibility is central to the way such models evaluate programs and program options--in terms of the current economic status of population subgroups.* Microsimulation models define units within households according to program statutes and economic relationships among household members. Public programs will often use different units in determining eligibility (for example, a person's SSI benefits would be affected if he or she were living rent-free in the household of an adult child, but OASDI benefits would not be affected). Moreover, since family members share income to meet their common needs, an individual's economic status depends on the composition and resources of the family as a whole. Hence, economic status is typically evaluated in terms of the family unit. Detailed survey information on household composition permits such statutory and economic relationships to be incorporated into estimates.

Because of differences in resources and ability to work, changes in benefit policies are often targeted for particular groups. The groups of interest to policymakers may be defined by income and asset levels, demographic traits, family composition, health, or work status, all of which are included in the SIPP. In a typical application, a program alternative would be considered in the light of its effects on the current economic status of such population subgroups.

IV. Issues and Goals

Data from surveys such as the SIPP enhance what is known about programs in two ways. First, the SIPP represents the general population, a broader universe than that of program data. This allows analysts to estimate the number and traits of nonparticipating eligibles and to consider proposals which increase program eligibility or participation. This feature will be advantageous for analysis of both OASDI and SSI.

Second, the SIPP will provide a richer characterization of recipients than program data; program data are restricted in that the only information collected is that necessary to the determination of eligibility and benefits. This advantage will prove particularly valuable for OASDI analysis; analysts will be able to characterize beneficiaries (or those affected by a specific benefit provision) in terms of additional dimensions of current financial status, family composition, and demographic traits.

The SSI Model

In the context of a means-tested program, a microsimulation model which uses data representing the general population allows us to consider the issue of program participation.

Measuring the extent to which SSI reaches its target population implies estimating both the eligible population (some of whom have never applied and, hence, are not represented in the administrative data) and the participant population. Finding SSI participants is less problematic; both surveys and administrative data have information on participants.[8] Determining which non-participants are eligible presents more obstacles. In general, they are not represented in program data. Furthermore, they cannot simply be asked if they are eligible for SSI as part of the survey process; many non-participants will not know if they are eligible.

One main purpose of the model, then, is to determine SSI eligibility.[9] In simple terms, the computer procedures which constitute the model take all survey respondents through an SSI eligibility determination and benefit calculation process. Their survey responses to questions on income, assets, household composition, and so on provide the basis for the estimates.

Some areas which may be considered using the SSI model include:

- Estimating SSI participation rates.
- Characterizing nonparticipating eligibles.
- Increasing the income guarantee levels.
- Liberalizing or eliminating the SSI asset test.
- Increasing SSI disregards.
- Effects of the SSI accounting period and other issues of program dynamics.

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[8] Identifying current recipients in surveys does pose some problems. The SIPP appears to have some advantages over the CPS in this area, but access to matched data will resolve problems of accurately identifying all current recipients in the survey context.

[9] There have been four recent simulation studies of the SSI program. See Leavitt and Schulz (1988), Zedlewski and Meyer (1989), Sheils et al. (1990), Doyle et al. (1990).

The OASDI Model

The report of the 1979 Advisory Council on Social Security included a statement of the principles underlying the OASDI benefit structure:

> From its beginning those responsible for the design of social security have sought to assure, on the one hand, a reasonable relationship between the social security taxes paid by individuals and the benefits they receive and, on the other hand, at least a minimally adequate income for long-term low-wage workers. Maintaining a reasonable relationship between taxes and benefits has been described as the goal of individual equity. Assuring a basic level of income has been called the goal of adequacy.[10]

A number of provisions, some in force and others proposed, are motivated by the adequacy goal. These include the "progressive" structure of the PIA, the spouse benefit, other dependent benefits, the minimum benefit (now repealed), and a special benefit for those over the age of 85 (proposed). Because of the scale of the OASDI program, some of these adequacy-related provisions have major effects. For example, over three million persons receive spouse benefits.[11]

Distributional analysis of such provisions has been impeded because no single data source contained the necessary elements. Both current and historical information are required. By design, recurring household surveys, such as the SIPP or the CPS, have information on current economic status, but their information on social security benefits and earnings is not sufficiently detailed for systematic program analysis. Analysis of OASDI does not merely require information on benefits received (which is reported on the surveys), and the type of benefit,

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[10] See page 55, Advisory Council on Social Security (1979).

[11] See Table 5.A1, Social Security Administration (1990).

e.g., worker, spouse, survivor (which can sometimes be inferred from survey information).[12] What is needed are the details of earnings histories required to calculate OASDI benefits and identify those affected by a specific provision. Yet due to respondents' limited recall, it is not feasible to collect earnings history data that are sufficiently detailed and reliable in surveys.

By contrast, administrative data have detailed information on earnings and benefits. However, since data on income other than earnings and information on all members of the family are not used to determine benefits, they are not available in the administrative data for the program. As a result, analysts often use the size of the OASDI benefit to suggest the financial circumstances of beneficiaries--a measure that does not take into account considerable differences in pension income, property income, and income received by other family members. The OASDI model will enhance analysts' capability to consider adequacy issues primarily by providing better information on the current financial circumstances, household composition, and demographic traits of those affected. Some issues for analysis include:

- Income distributional effects of the spouse benefit and proposals such as providing dropout years for caregivers.[13]
- The effects of specific OASDI provisions in reducing the rate of poverty or the poverty gap. For example, it has been suggested that an increase in the worker's benefit, intended to reduce inequities between one- and two-worker families, would have important effects as well on the poverty rates of widows.[14]

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[12] See Vaughan (1988).

[13] Such proposals are under investigation at the Social Security Administration. The SIPP matched data have been used in some early analysis of the implications of one approach; see Iams (forthcoming).

[14] See pp. 261-262, Ball (1978).

- Distributional effects of the "progressive" PIA structure, in terms of the family incomes of those affected.

OASDI/SSI Comparisons

OASDI, combined with income from other sources, is intended to provide adequate income for most of those with regular covered employment. However, OASDI benefits and other income are less likely to meet the needs of those who have neither worked regularly in covered employment, nor are dependents of someone who has. Hence a means-tested program such as SSI can be viewed as a necessary adjunct to a broadly-based contributory system.[15]

Not only SSI, but certain provisions of the OASDI program are motivated by adequacy concerns. Due to structural differences, however, the programs "target" benefits in distinctly different ways. Although SSI can be thought of as a residual program for those without sufficient resources from OASDI and other sources, the evidence indicates there is a problem of SSI nonparticipation. By contrast, under OASDI even when a benefit provision has an income adequacy objective, some benefits due to the provision are likely to be received by middle and high income groups.

For these reasons, when the policy objective is one of income adequacy, comparing OASDI options with SSI alternatives would be a promising analytical approach. Using the microsimulation approach, this suggests that the data source must have sufficient historical data on covered earnings to support an OASDI model and sufficient information on current resources

[15] For example, see p. 349, Ball (1978).

and characteristics to determine SSI eligiblity and to give a richer description of those affected, in terms of the dimensions of current economic status.

The model development we have undertaken, in combination with the SIPP match file we have described, should allow us to to make such OASDI/SSI comparisons. Some topics which may be considered include:

- An empirical analysis of basic structural alternatives. A broadly-based contributory system combined with a means-tested supplementary program (such as we have in the United States) could be compared with double decker systems used in other countries.
- Policy options with respect to the high rates of poverty among nonmarried aged women.
- Policy options with respect to the special needs of very elderly recipients--those 85 or older.[16]

V. Summary

The undertaking sketched in this paper builds on two long term data development efforts. First, a survey, the SIPP, was designed specifically to support analysis of public programs. Second, SSA earnings and benefit data have been matched to the SIPP. However, rigorous program analysis requires not only data that meet certain specifications, but an analytical tool--a capability to estimate eligibility, benefits, and the effect of behavioral responses from the underlying data. SSA is now developing this capability; because of the confidential nature of the matched data, an OASDI/SSI model such as this would probably be developed only at SSA.

[16] In the SIPP context, the small size of this group would require combining panels in order to increase the effective size of the sample.

This effort will support research on SSI participation rates and other SSI policy issues. In terms of OASDI research, analysts will be able to consider those affected by particular provisions in terms of the SIPP's rich data on current financial circumstances, demographic traits, and family composition.

Finally, this effort will allow policymakers to compare OASDI proposals with SSI alternatives. This should prove useful because although provisions of both programs are motivated by concerns about income adequacy, the programs have very different "targeting" outcomes.

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IMPLEMENTING AN SSI MODEL

USING THE SURVEY OF INCOME AND PROGRAM PARTICIPATION

I. Introduction

Supplemental Security Income (SSI) is a Federal-State cash transfer program designed to meet the minimum income needs of the Nation's low-income aged and disabled populations. This paper describes the initial stages of the development of an SSI microsimulation model based on the Survey of Income and Program Participation (SIPP). This work is part of a larger effort to exploit the SIPP to improve the Social Security Administration's (SSA's) ability to respond to questions about the operation of its programs. A broader description of the project and its rationale is presented in a companion piece by Wixon and Vaughan (1991).

An overview of major features of the SSI program which were addressed in the model development is given in section II of the paper. The data set used to implement the model is discussed briefly in section III. A description of the development and evaluation of the model and simulation estimates is given in section IV. Section V discusses some of our future plans.

II. Overview of the SSI program and the model

An overview of SSI.--Since the model attempts to mimic the eligibility and benefit determination process of the program to the extent permitted by the information available from the survey, an abbreviated description of program rules is required in order to understand the model development process. The eligibility determination involves three separate elements. The first involves establishing whether the individual meets one of the categorical criteria for program participation, i.e., is either disabled, blind, or is age 65 or older. The second and third involve determining financial need according to program criteria, i.e., whether an individual's or couple's countable income and resources (the program term for assets) fall below established limits. In 1984, the time-period covered by the SIPP data set we have been using, the monthly income limit for the Federal portion of the program was $314 for individuals and $472 for couples, and the Federal resource limits were $1,500 for individuals and $2,250 for couples.

(The respective values are $407, $610, $2,000 and $3,000 in 1991.) The income limits of individuals and couples who do not own their own living quarters, are not liable for rent, or do not pay their pro rata share of household expenses are reduced by 1/3.

Countable income is determined net of certain income disregards (the first $20 per month of earned or unearned income for an individual or couple, the next $65 of earnings, and one-half the remainder of earned income). Countable resources are defined net of certain exclusions (a home, household effects, and vehicle of reasonable value, life insurance with less than $1,500 of cash surrender value, an individual burial plot or burial funds of less than $1,500 held in separate account, and property essential to self-support).

In the case of a couple with only one categorically eligible spouse, income of the ineligible spouse is *deemed* to the spouse who is categorically eligible. After deduction of personal allocations for the spouse and for ineligible minor children living in the home, and after application of income exclusions, the remaining income, if any, of the ineligible spouse is added to the income of the eligible spouse for purposes of establishing the categorically eligible spouse's income eligibility and Federal payment amount. The full value of the countable resources of the ineligible spouse is also deemed to the eligible spouse. Finally, if the three elements of the eligibility test are met, the Federal benefit is calculated as the difference between countable income and the appropriate Federal benefit standard.

Representing the program with the model.--Obviously, SSI program rules are much more complex than indicated by this brief description. While the SIPP data do not permit modeling many of the most detailed features of the program, the model we have developed deals with the program in a more detailed fashion than suggested by this abbreviated description of program features. In general, the scope of the model was determined on the basis of a joint review of SSI procedures and the SIPP data items readily available to us. However, a full characterization of the model and what it does and does not address in terms of the full set of program provisions is precluded here because of space limitations. For the most part, however, the model was designed to represent the basic program features as presented in the foregoing discussion. Perhaps the primary design consideration was that the model represent the basic structural

features of the program which determine eligibility for and/or the amount of cash benefits (*e.g.*, unit formation, categorical eligibility, the income disregards and other income counting rules, including deeming, guarantee levels, and the resource test) in the most detailed fashion supported by the data and in a way that would permit evaluation of the effects of alternative program arrangements. Another important goal was to develop improved estimates of program participation under current and alternative program arrangements.

Principal limitations.--The model has three important formal limitations at the present time. (1) It is restricted to the noninstitutional population. Thus it cannot be used to address questions about the 10 percent of recipients residing in institutions. This limitation is imposed by the basic survey design. (2) It does not deal with State supplements, regardless of whether they are administered by SSA or directly by the States. (3) It is restricted to recipients age 18 or older. At a later stage, we plan to add modules to deal with State supplementation and to explore the feasibility of adding at least some capability for dealing with disabled children.[1]

III. The data

The model was developed using data from waves 3 and 4 of the 1984 SIPP panel. All demographic, income, and asset information, and basic survey weights were taken from wave 4. The detailed information on disability and health used to operationalize a categorical measure of work disability was obtained from the 3rd wave topical module and matched to the wave 4 file on a person-by-person basis. As a last step, the full combined wave 3-4 records of husbands and wives were matched to permit characterization of individual spouses as members of couples. Although SIPP files have been exact matched to SSA benefit and earnings data, the matched data files have not yet been used in our modeling work.[2] The basic file development was undertaken to support a wide range of analyses of the social and economic characteristics of the aged,

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[1] In 1984, the number of disabled child beneficiaries was relatively small compared to the other two program subgroups (only about 250,000 disabled children compared to about 1.7 million nonaged disabled adults, and 2.1 million recipients aged 65 or older). Recent court decisions affecting the operational definition of childhood disability are expected to lead to a substantial increase in the number of minor children receiving benefits.

[2] A more complete discussion of SIPP match files and their eventual role in the project is provided in the companion piece by Wixon and Vaughan (1991).

disabled, and survivor populations and took place prior to the inception of the current modeling project (DelBene and Vaughan 1989). All file development work and model implementation was done in the SAS language. Finally, since some wave 4 persons had not been interviewed in wave 3, detailed health information from the wave 3 topical module was not available for all wave 4 interviewed persons. This problem was addressed in the course of model development by creation of adjusted wave 4 weights.

A fair amount of data editing and aggregation, particularly in the area of assets, had been undertaken in connection with other earlier projects (DelBene and Vaughan 1989, Vaughan 1989), some of them SSI-related. The most important of these edits concerned eliminating the counting of equity in owned homes as equity in rental property. This problem arose because some homeowners with rental units in their homes also reported their residences as rental property. It was originally detected at the Bureau of the Census because the reported market value of the putative rental property exactly matched the corresponding value reported for the home. Under SSI program rules, the total equity of the home property is excluded from the resource test, even in instances in which the home property might be a duplex. The presence of this problem undoubtedly contributed to Leavitt and Schulz's finding (1988, p. 16 and table 21) that 30 percent of the income eligible-asset ineligible aged owned rental property. Incidentally, our work on this problem led to questionnaire modifications in subsequent SIPP panels. A good deal of additional work of this sort was done to reformulate native survey variables so that they would more closely approximate program constructs. This process continued in an iterative fashion throughout the course of model development as our evaluations revealed shortcomings and suggested modifications to our original approaches.

IV. Development of the model and evaluation of the model and the simulation estimates

The basic approach.--In the balance of this paper we will discuss the approach we have taken to developing and validating the model.[3] In addition to the usual techniques of reviewing the input and output values of key modules, range checking the output values of critical model variables and general review of the code by other analysts, once the model was basically operational it was further tested by attempting to simulate eligibility and Federal benefit amounts for persons reporting SSI in the survey. Seven simulation runs were made for the reported participants, the performance of the model was reviewed each time, and modifications were introduced to address observed shortcomings. Special attention was given to monitoring three types of model output by comparison of:

- the number of SSI recipients reported in the survey and simulated to meet each of the three basic eligibility criteria (categorically defined work disability,[4] income, and resources) to the total number reporting SSI;
- the size distribution and mean of the simulated Federal benefit amount to independent estimates of the actual size distribution and mean benefit amount; and
- the number of participants simulated to be eligible for a Federal payment to independent estimates of the number of Federal participants in the survey universe.

These comparisons were made both on the basis of eligibility units (individuals and married couples) and persons. As a final step in the evaluation of this preliminary implementation of the simulation, the model-based eligibility and participant estimates were compared with SIPP- and CPS-based estimates developed by other researchers. Because of space limitations, we are only able to report the most important highlights of the various aspects of our review.

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[3] An important aspect of our evaluation of the model estimates involved an exploration of the extent to which the model estimates of the size of the eligible nonparticipant population and of participation rates are affected by a series of simple adjustments designed to address some of the known or suspected shortcomings of the simulation. Space considerations prevented including a full discussion of that exploration in the proceedings. However, the topic is dealt with in an addendum available from the authors.

[4] The SSI program considers beneficiaries age 65 or older who established categorical eligibility on the basis of disability or blindness prior to age 65 to be "disabled" or "blind" rather than "aged". In the present context, all beneficiaries aged 18-64 are considered to be "disabled" even though some were operationally identified based on visual impairments. All recipients age 65 or older are treated as "aged", and since the measurement of categorical eligibility for the aged is straightforward, it was not separately monitored.

Table 1.--Comparison of administrative and simulated size distributions of monthly Federal SSI payment amounts, adult units, monthly average, August – November, 1984 [1]

Federal benefit amount	Administrative estimate [2]	Version of the simulation, 1984 SIPP						
		Estimate I [3]	Estimate II [4]	Estimate III [5]	Estimate IV [6]	Estimate V [7]	Estimate VI [8]	Estimate VII [9]
Survey units reporting Federally administered SSI	...	3,354.4	3,354.4	3,338.6	3,250.3	3,181.6	3,250.3	(10)
Income eligible								
Number in 1,000's	3,114.0	2,721.0	2,840.0	2,829.3	2,794.7	2,752.3	2,809.5	2,804.7
Percent distribution	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
$1 – $19	4.2	3.5	3.1	3.1	3.0	3.0	3.0	3.0
$20 – $39	5.8	6.4	6.1	6.2	6.2	6.3	6.3	6.3
$40 – $59	6.2	7.1	5.1	5.1	5.2	5.2	5.2	5.2
$60 – $79	5.5	6.7	6.0	6.0	5.9	5.9	5.8	5.8
$80 – $99	4.8	3.7	3.8	3.8	3.8	3.7	3.7	3.5
$100 – $119	4.4	4.0	3.1	3.1	2.9	3.0	3.0	3.0
$120 – $139	4.0	4.4	4.3	4.3	4.3	4.4	4.3	4.3
$140 – $179	12.4	11.0	14.8	14.8	14.8	14.6	14.5	14.5
$180 – $208	2.9	4.0	4.4	4.4	4.5	4.4	4.4	4.4
Exactly $209	5.7	15.6	0.2	0.2	0.2	0.2	0.2	0.2
$210 – $259	3.0	2.2	3.5	3.5	3.4	3.4	3.4	3.4
$260 – $313	2.2	2.5	3.0	3.0	2.8	2.7	2.8	2.8
Exactly $314	36.8	26.6	40.0	39.5	39.8	39.9	40.1	40.2
$315 or more	2.2	2.4	2.7	3.1	3.1	3.1	3.2	3.3
Mean	$199	$188	$207	$208	$208	$208	$209	$209
Index of dissimilarity [11]	...	14.7	10.1	10.1	10.2	10.1	10.3	10.4

(...) – Not applicable.

[1] Excluding units consisting of child beneficiaries under age 18.

[2] Excludes recipients living in Medicaid institutions but includes recipients living in other institutional settings excluded from the survey universe. Tabulated directly from the SSI Characteristics Extract Record (CER). Amount refers to budgeted Federal payment and excludes retroactive payments and adjustments.

[3] With assignment of approximately 30 percent of recipients as living in the household of another (*type B living arrangement*).

[4] All recipients treated as living in their own households (*type A living arrangement*).

[5] Incorporates extended categorical eligibility code for disability and eliminates units with members under age 18.

[6] Eliminates from the simulation universe categorically ineligible parents reporting the presence of one or more children with a health impairment and presumed to be reporting SSI benefits received by one of the impaired children.

[7] Eliminates unit members not interviewed in wave 3.

[8] Adjusts weights to compensate for the elimination of unit members not interviewed in wave 3.

[9] Implements treatment of rental assets under property essential to self-support rules and minor revisions to health definition.

[10] Not available.

[11] One-half the sum of the absolute differences between the survey and the CER-based program estimates by size category.

Source: Division of Economic Research, Office of Research and Statistics, Social Security Administration. Simulations based on waves 3 and 4 of the 1984 panel of the Survey of Income and Program Participation (SIPP)

The 1/3 reduction rule and the definition of disability.--Our evaluation of simulated eligibility and benefits for reported participants led to two significant modifications of the first operational version of the model: (1) the attempt to simulate the benefit reduction associated with living in the household of another (in program parlance a *type B living arrangement),* was eliminated, and (2) the survey-based definition of disability-based categorical eligibility was expanded.

Because the 1984 SIPP panel did not collect the information needed to determine if non-owners had rental liability or contributed their pro rata share of household expenses, the assignment of type B living arrangement had to be made largely on the basis of household relationships, i.e., operationally, all participant units which included the household reference person, a reference person's spouse, an adult sibling of the reference person, household member unrelated to the head, or a person listed as a co-owner of the home were considered to be "own household" units. All others were assigned a type B living arrangement and thus were subject to the 1/3 reduction. This procedure yielded far too many recipient units with type B living arrangements (26 percent as opposed to about 6 percent as indicated by program data). Comparison of the simulated and actual monthly benefit size distributions (see the first two columns of table 1) indicated too many units receiving the maximum payment for an individual living in another's household ($209) and too few receiving the usual maximum for individuals ($314), thus confirming that the overassignment was having an undesirable effect on the simulated size distribution as well. Suppressing the assignment of the 1/3 living arrangement reduction increased the degree of similarity between the new simulated size distribution, shown as Estimate II in column 3 of the table, and the actual size distribution (as indicated by a decline in the distributions' index of dissimilarity from 14.7 to 10.1).[5] At the same time, the difference between the simulated and actual average monthly benefit shifted from an understatement of $11 to a slightly smaller overstatement of $8, a reduction of just less than 25 percent in the absolute

[5] The index of dissimilarity may be interpreted as the percentage of recipient units in the simulated distribution that would have to shift monthly benefit amount categories to obtain equivalent distributions. The index is constructed by taking the absolute difference between the administrative and survey percentage for each amount category, summing across all categories, and dividing by 2.

difference between the simulated and actual means. In addition, the number of units simulated as income eligible also increased (by about 4 percent) and the percentage of units simulated as income eligible rose from 89 to 93 percent. Of course, such an increase would be expected, since the income standard for units initially classified as living in the household of another effectively increased by 50 percent.

Despite the fact that suppression of the 1/3 reduction rule reduced the discrepancy between the simulated and actual Federal benefit estimates, inspection of the proportion of units falling in the $209 and $314 size categories in the simulated distributions subsequent to Estimate I also shows that the failure to adequately account for the 1/3 reduction rule contributes to distortion of the simulated size distribution, if to a lesser degree. In fact, an informal assessment suggests it could account for 4-5 out of the 10 points of the index of dissimilarity for the final Estimate VII size distribution and perhaps 1/3 of the remaining discrepancy between the actual mean and the final Estimate VII mean.

Beginning with the 1987 panel, information on rental liability and expense sharing was added to the standard SIPP data set. We look forward to using these new data when we are able to take advantage of the more recent panels.[6]

Initially, the measure of categorical disability was defined to include only persons reported as unable to work because of a health condition or disability. Review of the results of this assignment revealed two difficulties: (1) approximately 30 percent of the nonaged participants were not being classified as disabled by the measure, and (2) the reported number of participant units exceeded the number of units believed to belong to the survey universe. After some consideration, we took three steps designed to address these two problems. First, we expanded the definition of categorical disability to cover three additional groups (Estimate III):

[6] Incidentally, the general approach we used to represent the 1/3 reduction rule is likely used in many CPS- and SIPP-based SSI simulations (see for example, Sheils, *et al.*, 1990, pp. IV-63 to IV-64).

- disabled persons able to work, but only occasionally or irregularly, and with earnings, if any, below the maximum allowable under the program in each of the four months prior to interview, *i.e.*, below the maximum Substantial Gainful Activity (SGA) amount of $300;[7]
- individuals reported to be unable to read ordinary print in a newspaper with glasses or contact lenses, and;
- persons classified on the basis of procedures developed in earlier research (Vaughan 1989) as receiving a social security disability benefit.

These three changes increased the number of units classified as categorically eligible on the basis of disability by about 116,000.

Second, about 90,000 parents, categorically ineligible under the extended survey definition and who were reported to have a minor child with a health impairment, were also eliminated from the participant universe (Estimate IV). These individuals were considered to be reporting the child's SSI benefit rather than to be participants in their own right. This decision was motivated by three considerations. First, the 1984 SIPP panel did not collect information on SSI benefits received by children *per se*, thus requiring that it be reported on the parent's own questionnaire if it were to be reported at all. Second, the fact that the number of nonaged adult participants and participant units nominally exceeds independent estimates of the number in the survey universe[8] provides indirect evidence of such reporting anomalies. Finally, the simulated financial eligibility rate for the categorically ineligible was considerably below that for the balance of participants, further suggesting that there may indeed have been a group of nonparticipants who were not disabled among the nonaged reporting receipt of SSI benefits in the survey.

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[7] As it turned out, all participants in this group with earnings had earnings below $190, the SGA minimum.

[8] However, even after the edit, parents of minor children remained disproportionately represented among those reporting recipiency but no work disability. The size of the differential suggests that there could well be 40,000 or so additional parents who are erroneously identified as recipients because they reported their disabled child's benefits on their own questionnaires. The final resolution of this problem rests with the use of later panels which directly enumerate children's SSI benefits and/or the development of matches with SSI program data so that actual recipiency status can be more accurately determined. In the meantime, the remaining problem likely exaggerates, slightly, the extent to which survey health variables appear to underidentify nonaged adult participants categorically eligible on the basis of health.

Finally, we discarded approximately 70 thousand participant units with at least one nonaged member for whom detailed disability information was not available because they had not been interviewed in wave 3 (Estimate V). The participant sample was then reweighted to compensate for the deletions (Estimate VI). Such units were also discarded from the nonparticipant sample after which it was also reweighted.

Characterization of the Federal benefit estimates.--The basic character of the Federal benefit estimates was evident from our discussion of the problems surrounding the one-third reduction rule. The simulated size distribution appears to reproduce the program size distribution fairly well, and the simulated means are also reasonably close to the program mean. The same degree of similarity is observed when the simulation results are given at the person level and disaggregated by age (data not shown). Given that the benefit size distribution represents the key program output, the relatively close alignment between the simulated and actual size distributions speaks well for both the model and the underlying SIPP income data. If allowance is made for the remaining problems associated with the 1/3 reduction rule, the simulated size distributions would appear to come just about as close to reproducing the actual distributions as is the case for reported social security benefits in the SIPP (Vaughan 1989). We also feel that close attention to the character of the simulated size distribution proved to be very valuable in identifying and overcoming problems with the model and would recommend that other modelers closely monitor it as well. Finally, although we did not make use of administrative data on social security benefit amounts from the SIPP match file in this preliminary work, substitution of the administrative amounts for the survey reports of social security would likely be quite instructive. Since social security is by far the most frequent source of income received by participants and nonparticipating eligibles, use of actual amounts might well reveal a good deal about the relative contribution of model weaknesses and nonsampling error to the overall error affecting simulated benefits.

Comparisons of the eligibility estimates for participants to independent estimates.--The survey estimate of the number of persons receiving Federally administered SSI, along with the corresponding independent estimate, is given in the left half of table 2. The number of

Table 2.--Comparison to independent estimates of the number of persons reported to be Federally administered Supplemental Security Income (SSI) recipients and simulated as eligible for a Federal payment by age, monthly average, August–November, 1984

[Recipients in thousands]

Characteristic	All persons receiving a Federally administered payment			Persons receiving a Federal payment		
		Age			Age	
	Total	18–64 [1]	65 or older	Subtotal	18–64 [1]	65 or older
Number of recipients from administrative data						
Total [2]	3,839.8	1,729.9	2,109.9	3,507.1	1,644.4	1,862.7
Living in institutions [3]	355.3	208.5	146.8	343.2	202.8	140.4
Medicaid certified [2]	186.4	94.3	92.1	186.4	94.3	92.1
Other [4]	168.9	114.2	54.7	156.8	108.5	48.3
Number of noninstitutionalized recipients [5]	3,484.5	1,521.4	1,963.1	3,163.9	1,441.6	1,722.3
Number of recipients reported in the survey						
Reporting Federally administered SSI [6,7]	3,478.7	1,700.2	1,778.5	(8)	(8)	(8)
As a percent of noninstitutionalized recipients	99.8	111.8	90.6	(8)	(8)	(8)
Simulated Federal eligibility status [9]						
Number						
Categorically eligible	...	...	...	3,163.5	1,385.0	1,778.5
Income eligible	...	...	...	2,990.7	1,478.9	1,511.7
Resource eligible	...	...	...	3,255.1	1,648.1	1,607.1
Three–way eligible	...	...	...	2,596.7	1,225.3	1,371.4
As a percent of noninstitutionalized recipients						
Categorically eligible	...	...	...	100.0	96.1	103.3
Income eligible	...	...	...	94.5	102.6	87.8
Resource eligible	...	...	...	102.9	114.3	93.3
Three–way eligible	...	...	...	82.1	85.0	79.6

(...) – Not applicable.

[1] Includes disabled children age 18–21.

[2] Budgeted for payment, monthly average, August through November, 1984 as estimated directly from the Characteristics Extract Record (CER).

[3] Estimated using the ratio of Medicaid institutionalized to total institutionalized as estimated from the Quality Assurance Review sample for October 1986 – September, 1987 with an adjustment to account for units receiving only a Federally administered state supplement among the institutionalized living in nonmedicaid facilities.

[4] Residual.

[5] Total minus number living in institutions.

[6] Based on the 4th wave of the 1984 panel of the Survey of Income and Program Participation.

[7] Including persons with Federal SSI, a Federally–administered State supplement, or both.

[8] Not available.

[9] Persons simulated to be eligible for a Federal SSI payment using version VII of the preliminary model.

Source: Division of Economic Research, Office of Research and Statistics, Social Security Administration.

participants simulated as eligible for a Federal payment according to the three eligibility criteria (categorical, income, and resources) are compared to independent estimates of the numbers of participants belonging to the survey universe on the right-hand side of table 2.

Because SSI participant status is reported in the survey in a way that appears to identify all persons receiving Federally-administered payments (including those receiving only a Federally-administered state supplement), receipt of a Federal payment *per se* is not directly observable. Consequently, the simulation had to be run against all persons reporting Federally-administered payments. For this and other reasons, estimates for some of the separate dimensions of eligibility exceed the independent estimate of the total number of persons receiving a Federal payment.

There are three particularly noteworthy aspects to the table. First, some detail is given on the derivation of the independent estimates. It is important to note that the estimate for the institutionalized includes persons living in institutional settings other than those certified to receive reimbursement under the Medicaid program. This is important because analysts have tended to make adjustments for only the Medicaid institutionalized (see the top section of the table). Second, as shown in the middle of the left panel of the table, the survey estimate of the number of nonaged adult recipients exceeds the corresponding independent estimate while the estimate for the aged falls short of its independent estimate. These differences arise from some unknown combination of sampling, nonsampling and coverage errors. Finally, the estimates of participants eligible according to all three of the eligibility criteria range between 80 and 85 percent of the corresponding independent estimates (82 percent for both categories of participants combined, 85 percent for nonaged disabled adults, and 80 percent for the aged, as shown in the table's lower right panel). These differences are attributable to a combination of the sampling, nonsampling and coverage errors noted above plus errors in the model and the additional direct effect that nonsampling errors have on the model estimates.

Comparisons with other studies.--Following standard practice, we compared our participation and eligibility estimates with those of other researchers. Results from the four

SIPP- and CPS-based studies listed in the reference section, all those we were readily able to locate that provided the required information, were considered.[9]

For the aged, there is a clear difference between participation rates stemming from CPS-based simulations and those based on the SIPP.[10] Excluding one very low SIPP-based estimate, which would appear to be something of an outlier, the average participation rate for the SIPP-based simulations is 63 percent, or 9 percentage points above the average for the CPS-based simulations. The participation rate as estimated from version VII of our model is 60 percent and so falls in the range given by the other studies based on SIPP.

We were able to locate only two other recent studies, one based on the SIPP (Doyle, *et al.* 1990) and one on the CPS (Zedlewski and Meyer 1989), that gave participation rate estimates for nonaged disabled adults. In the CPS study, the participation rate given for nonaged disabled adults was similar to that for the aged (55 percent). However, the rate given in the SIPP-based study was considerably lower (37.8 percent), close to the 41 percent participation rate from our simulation. Although there are a number of differences among these three studies which somewhat hinder comparisons, it appears that the two SIPP-based studies (our own and that of Doyle *et al.)* differ from the CPS-based study principally in their estimate of the number of nonparticipating eligibles. This may well reflect the fact that the 1984 SIPP disability measures are more comprehensive than those available from the CPS. However, it struck us as particularly noteworthy that the two SIPP-based rates for the nonaged were so much below the SIPP-based rates for the aged. While it is certainly conceivable that the actual participation rate for the nonaged disabled could differ from that of the aged, there is no obvious reason why this should be the case. In fact, recent SSA studies (Oberheu 1991, 1990) suggest a possible explanation--if those found to be financially ineligible are excluded, about half of disability appli-

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[9] A table comparing these studies' estimates of eligibles, participants, eligible nonparticipants, and participation rates is available from the authors.

[10] Other work we have done suggests that most, if not all, SIPP/CPS differences are attributable to a larger number of income eligible, resource ineligible aged given by the SIPP. In our work, when only resources (assets) also identified in the CPS are considered in the SIPP context, SIPP and CPS estimates of the number of eligible but not participating aged were quite similar. This finding held regardless of whether the CPS subset of SIPP assets was defined on the basis of the directly measured SIPP values or on the basis of a 6 percent capitalization of the respective income flows.

cants during 1986-87 did not meet the program disability criteria and were denied benefits.[11] Thus the low participation rate for the nonaged disabled relative to the aged, taken together with the substantial disability denial rate experienced by actual applicants during approximately the same time period, suggests that the SIPP health measures may be identifying as disabled many nonparticipants who would not be found to meet the program definition of disability were they to apply for benefits. Indeed, if the individuals defined as categorically eligible by the survey measures were only as likely to meet program definitions of disability as were 1986-87 applicants, the estimated number of nonaged disabled eligible nonparticipants would be halved. This would yield an adjusted participation rate of 58 percent, a rate not appreciably different than that simulated for the aged under version VII of the model (60 percent).

V. Future plans

In general we are pleased with our experience so far in using the SIPP as the basis for modeling the SSI program. Of course, as we have indicated, a number of problems remain. We expect to work with the Bureau of the Census to enhance the selection of SIPP variables relevant to SSI modeling. Our efforts to edit the native SIPP data so that they better represent program variables will continue. We also look forward to expanding the reach of our preliminary model to include State supplementation. Implementing the model on more recent SIPP data sets, especially those which will permit a more adequate treatment of SSI rules regarding living arrangements, is also a high priority.

We would like to incorporate data from the SIPP match files to better identify SSI participants and to substitute administrative data on social security benefit amounts for reported values. The use of these matched data will lead directly to improved model estimates and will permit more precise evaluation and calibration of the model by providing a known population of participants to test it against. Since the matched data should also allow us to identify recent

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[11] In Oberheu's studies, initial denials that were changed to allowances within 18 months of application were treated as allowances. The 50 percent disability denial rate was calculated by the present authors by excluding from the denominator those who were recorded as ineligible because of excess income or resources or who died prior to completing the eligibility determination process.

denials and identify the basis of denial, we may also be able to learn more about the strengths and weaknesses of the survey health measures when used as proxies for the programmatic definition of disability.

Finally, over the longer term, we expect to expand our modeling effort to the social security program itself in order to provide SSA with improved analytical tools for answering distributional questions about the Old-Age, Survivors, and Disability Insurance (OASDI) program *per se* and for comparing trade-offs between SSI and OASDI alternatives when policies focusing on income adequacy are at issue.

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