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# NONCASH INCOME, EQUIVALENCE SCALES, AND THE MEASUREMENT OF ECONOMIC WELL-BEING

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Little attention has been paid to the importance of consistency between the specifications of the income and the equivalence scales used in measuring economic well-being when noncash income is included in the definition of income. This article finds that inconsistency between the income and needs sides of a comparison can be important when some types of noncash income are included. An upward bias in the measured economic status of the aged when Medicare is included in income and an ordinary equivalence scale is used is presented as an example of the important effects of this consistency problem.

## I. INTRODUCTION

The economic well-being of subgroups of the population usually is measured by comparing resources and needs. Much attention has been paid to the appropriate definition and valuation of resources such as income. There also has been a great deal of research done on the specification of appropriate adjustments for needs, especially differential needs of subgroups of the population as reflected in equivalence scales.[1]

Those two sides of the comparison, however, often have been treated separately when specific issues are discussed. Little attention has been paid to the importance of consistency between the specifications of the resources and needs sides of comparisons of economic well-being (Radner, 1992). The potential importance of this "consistency problem" is large when the definition of income includes some types of noncash income that have needs associated with them that are unmeasured in the usual equivalence scales.[2] In recent years the use of comprehensive definitions of income that include noncash income has become more widespread, thus increasing the possible importance of the problem. Also, because some large noncash income types are relatively concentrated in particular subgroups of the population, there is a potential for serious distortion of the measured status of those subgroups. Examples of such noncash income types

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[1]Jenkins and Lambert (1993) presented a method for ranking income distributions that does not require the use of cardinal equivalence scales.

[2]The consistency problem is not confined to the case of noncash income. For example, there could be inconsistency between needs specified for cash income before tax and income defined as cash income after tax. The noncash income case is the only one discussed in this article.

include Medicare received by the aged, Medicaid received by low-income units, and education subsidies received by families with school-age children.

Almost all of the research in the U.S. that addresses this consistency issue in relation to noncash income has been in connection with the measurement of poverty. Appropriate poverty income thresholds for definitions of resources that include noncash income have been discussed extensively, although no consensus has been reached (Bureau of the Census, 1986). For types of noncash income that have unmeasured needs associated with them, however, it is generally agreed that poverty income thresholds should be adjusted if any of those income types are included in the definition of income (Citro and Michael, 1995).

This consistency problem, however, is not confined to the measurement of poverty. It is also relevant for the specification of equivalence scales in the assessment of the economic well-being of subgroups in general.[3] The discussion of noncash income and poverty measurement, however, has not had a significant impact on the choice of equivalence scales in assessments of general economic well-being. The general consistency problem has received little attention, perhaps because of a perception that the effects of this inconsistency are insignificant.[4]

In this exploratory article it is shown that the consistency problem, in some cases, is important for the general assessment of the economic well-being of subgroups. The same equivalence scale usually is applied to different definitions of resources. This use is often inappropriate conceptually and is an important problem empirically in at least some cases. It should not be assumed that the relative needs of different subgroups remain unchanged when the definition of income changes. Most equivalence scales have been formulated or estimated for use with cash income. It is argued here that, in some important cases, such scales are not appropriate for a definition of income that includes noncash income because needs associated with the noncash income are not taken into account.

It is very difficult to generalize about the importance of the consistency problem because its importance varies from case to case with the types of noncash income included, the valuations of those types, and the equivalence scales used. Its importance also depends on the purpose of the analysis and the questions addressed in that analysis.

As an example of the effects of the consistency problem, this article focuses on the economic well-being of the aged compared with other age groups and on Medicare noncash income.[5] The emphasis is on consistency in the context of practical measurement problems. Several hypothetical cases are discussed.

[3]The consistency problem discussed here is one aspect of the general problem of the misspecification of relative needs of subgroups of the population. Misspecification can occur whether or not an equivalence scale is used. If the economic well-being of subgroups is compared using income amounts and an equivalence scale is not used, the implicit assumption is that the units compared have equal needs. This assumption might produce misleading comparisons of economic well-being if relative needs differ. The inclusion of noncash income can make the assumption of equal needs even less acceptable than it might be for cash income.

[4]The discussion of noncash income and poverty measurement involved the official U.S. thresholds, which are adjusted over time only for inflation. The consistency problem also applies when the poverty threshold is specified as a fraction (e.g. one-half) of median or mean income adjusted using an equivalence scale. The consistency problem has not, to the knowledge of this author, been discussed in relation to that type of measure of poverty.

[5]Medicare is a government health plan that provides medical care for the aged and the disabled. See Social Security Administration (1993) for a description of the Medicare program.

Illustrations of the effects on the relative economic well-being of the aged produced by two crude modifications to an equivalence scale are presented using household survey income data. Those modifications account for the presence of unmeasured medical needs associated with Medicare noncash income. The conclusion is that there is substantial uncertainty about the true relative status of the aged. The usual measures that include both cash and noncash income but take only cash needs into account tend to overestimate the economic status of the aged, but the amount of overstatement, although it is likely to be substantial, is not known.

The detailed analysis in this article is limited to the frequent case in which the definition of income has already been selected and an equivalence scale has to be chosen for use in the analysis. It usually is not feasible for researchers to estimate their own equivalence scales. The case in which the equivalence scale is estimated in a consistent manner as part of the analysis (e.g. Danziger *et al.*, 1984) is not discussed here.

Some types of noncash income, such as food stamps, are not important sources of potential bias because they generally do not have unmeasured needs associated with them. Food stamps generally are considered to be used in place of cash income to meet food needs reflected in existing equivalence scales. This article focuses on noncash income types that have unmeasured needs associated with them.

An example can help clarify the nature of the consistency problem discussed here. The treatment of Medicare in assessments of economic well-being is the most important example of the consistency problem for the aged in the U.S. Except in connection with poverty measurement, discussions of Medicare generally have focused solely on the income side (with the emphasis on valuation issues). Compared with the nonaged, the aged have a greater need for medical care, but this difference is rarely, if ever, taken into account adequately when medical noncash income is included in the definition of income. The appropriate specification of needs associated with Medicare has received little attention.

If the value of Medicare is included in income and medical needs are underestimated, then groups, such as the aged, that have greater medical needs (i.e. are "sicker") and receive Medicare could be estimated to be better off (i.e. "richer") than other groups. If the value of Medicare is included in income, then the needs side (i.e. the equivalence scale) should include the medical needs paid for by Medicare. If Medicare is included in income, but only those needs not paid for by Medicare are included on the needs side, then the measured economic status of the aged will tend to be biased upward. This result would be obtained because unmeasured needs are omitted.

In recent years comprehensive definitions of income that include noncash income frequently have been used in the assessment of the economic status of the aged. Influential articles on this topic (e.g. Hurd, 1990; Smeeding, 1989) have used several equivalence scales that do not explicitly take needs associated with noncash income into account in conjunction with comprehensive definitions of income (including Medicare) and have concluded that the elderly were much better off when noncash income was included in the definition of income.[6]

[6]Hurd primarily used Smeeding's estimates in the relevant part of his analysis. For a discussion of these and several other estimates, see Radner (1993).

Estimates of this type, however, contain the potential for bias because of a possible lack of consistency between the comprehensive definitions of income and the equivalence scales used. The ratio of the needs of the aged to the needs of the nonaged is not likely to be the same for needs associated with cash income and needs associated with cash plus Medicare and other noncash income types. This inconsistency could produce a substantial upward bias in the measured relative economic well-being of the aged. Of course, broad definitions of income usually include several types of noncash income other than Medicare; this comprehensiveness makes the analysis of any bias much more complex because biases produced by specific income types could be offsetting to some degree.

In Section II of this article, the relationship between noncash income and equivalence scales is discussed. Illustrative estimates using the example of Medicare and the aged are presented in Section III. A summary and conclusions appear in Section IV.

## II. Noncash Income and Equivalence Scales

An equivalence scale is a scale that shows amounts of income (or consumption), relative to the amount for a base unit, that units with different characteristics (e.g. size and/or composition) require to be at the same standard of living. Equivalence scale values almost always differ by the number of persons in the unit; economies of scale are usually assumed to be appropriate for multi-person units. Differences between adults and children are included quite often, and many other classification variables (e.g. sex, ages of adults and children, region of residence) sometimes are used.[7]

There is an extensive literature on equivalence scales and a great deal of disagreement about the proper specification of those scales (e.g. Nelson, 1993). It is generally accepted that commonly used equivalence scales provide only rough approximations of the true differences in needs among subgroups of the population.

In general, when equivalence scales are discussed, it seems to be assumed that they are applied to cash income, although ordinarily that is not specified. Equivalence scales based solely on unit size (and perhaps on adult-child differences) may be reasonable approximations of the true scale when cash income is used. When some types of noncash income are included, however, this may no longer be a reasonable assumption.

An equivalence scale based on the official U.S. poverty thresholds is used in the example presented in this article. In the current version of the poverty thresholds, the equivalence scale values differ by size of family unit, number of related children under 18 years of age in the family unit, and, for family units of 1 or 2 persons, by the age of the reference person (under age 65 or age 65 and older) (Bureau of the Census, 1993a).[8] Those aged units are assumed to require 8–10

[7]Equivalence scale values ordinarily do not differ by health status. An equivalence scale that included such differences would be related to the crude equivalence scales adjusted for needs associated with Medicare that are used in the estimates presented in this article.

[8]A family unit is either a family (two or more related persons living together) or an unrelated individual (a person who lives with no relatives) (Bureau of the Census, 1993b).

percent less than corresponding nonaged units. The poverty threshold equivalence scale was intended for use with cash income.[9]

The consistency problem and its relationship to equivalence scales can be illustrated by considering a hypothetical example. Let us consider two simple hypothetical cases; in both cases there are two 1-person units, one aged and one nonaged. Assume that the nonaged unit is the base unit for the equivalence scale. Consider case I, in which the government pays a substantial part (e.g. $3,000) of the medical expenses of an aged person directly. Let us assume that, with those expenses paid for by the government, the aged and nonaged persons require the same amount of cash income to put them at the same standard of living (e.g. $10,000 cash income). That is, both the nonaged and aged persons have equivalence scale values of 1.0 for cash income.

In case II, the government does not pay for those medical expenses of the aged person. In this case the aged person has a greater need for cash income ($13,000) than the nonaged person does ($10,000) (or than the aged person did in case I) because the aged person has those medical needs to pay for in addition to her other needs. In case II, the aged person has a scale value for cash income of 1.3, while the nonaged person has a scale value of 1.0.

We now return to case I and change the definition of income to include the noncash medical expenses ($3,000) the government pays for the aged person. The aged person then has a greater need for cash plus noncash income ($13,000) than the nonaged person does even though both the aged and nonaged persons have equal need for cash income ($10,000); this difference is due to the medical needs added in.[10] Using cash plus noncash income, the aged person has a scale value of 1.3, while the nonaged person again has a value of 1.0. If the case I cash income equivalence scale values (1.0 for both persons) were used in this case, then the relative needs of the aged person for cash plus noncash income would be underestimated. Thus, comparing cash plus noncash income with an underestimated measure of needs would overestimate the economic well-being of the aged person relative to the nonaged person.[11]

It is assumed in most of this article that, at least at the poverty level, medical needs paid for by Medicare are not included in the needs reflected in the equivalence scales that are generally used. This is likely to be a reasonable assumption for several reasons. As discussed above, an equivalence scale formulated for cash income probably would not be appropriate for cash income plus Medicare. Also, where equivalence scales are estimated from expenditure data, those data ordinarily exclude expenses paid for by Medicare since those items are not paid for

[9]An important point related to the consistency problem is that relative needs for cash income can differ as a result of differences in the extent to which noncash income meets needs. Phipps and Garner (1994) discussed this point in connection with government medical insurance coverage and possible differences between equivalence scales in the U.S. and Canada.

[10]Although this example is discussed in terms of individuals, the same argument applies to groups and the market value of noncash income calculated on an insurance basis, the case discussed in most of this article.

[11]The problem can also be discussed in a similar manner in terms of consumption rather than income. The case of consumption is important because equivalence scales estimated using consumer expenditure data generally use out-of-pocket expenditures and therefore may omit some needs associated with noncash income.

directly by the consumer. Finally, at low levels of cash income, the value of Medicare (in the example used here, the market value calculated on an insurance basis) is sufficiently high that it is unlikely that the associated needs are included in the usual equivalence scales because the inclusion of those needs would imply that cash needs are unreasonably small.[12]

A discussion of relative needs at poverty levels of cash income can illustrate this last point. One implication of an equivalence scale applied at low income levels is that some types of units are assumed to require very little cash income. This problem is magnified when noncash income is included in the income definition. This problem applies to other scales as well as to the poverty threshold scale; some other scales produce comparisons that are more extreme than the poverty threshold scale. A discussion of several examples follows.

In the official 1992 poverty thresholds, a nonaged 1-person unit requires $7,299 to be at the threshold, while an aged 1-person unit, either male or female, requires $6,729. If the latter amount includes about $3,000 in Medicare noncash income, then an aged person with about $3,700 cash income is measured to be about as well-off as a nonaged person with about $7,300 cash income.[13]

Using the frequently applied van der Gaag–Smolensky scale,[14] relative to a 1-person unit consisting of a male aged 35–54 receiving $7,299 annual income (the official poverty threshold), an aged female in a 1-person unit requires only $2,654 to be as well off as that nonaged male.[15] This is a very low amount, even when noncash income is excluded. If Medicare is included in income, then an aged female with zero cash income but receiving $3,000 of Medicare is measured to be better off than the nonaged male.

Similar comparisons can be made for couples. Couples consisting of two aged persons generally would receive about $6,000 in Medicare noncash income. The poverty threshold in 1992 for an aged couple was only $8,487, while the threshold for a nonaged couple was $9,443. Thus, an aged couple in which both received Medicare would require only about $2,500 cash income to be as well off as a nonaged couple receiving about $9,400. These examples show that the inclusion of at least some noncash income types can produce inappropriate results if adjustments are not made on the needs side.

As mentioned earlier, almost all of the relevant research on noncash income and needs has been in connection with the measurement of poverty. The ongoing debate in the U.S. about the appropriate poverty thresholds for use with an income definition that includes several types of noncash income is relevant. Both the level of the thresholds and the equivalence scale (i.e. relative needs) embodied in those thresholds have been questioned, at least implicitly.

[12]Specification of needs at low levels of income is very important for the aged; in 1992, almost half of aged family units had cash income that was less than twice their poverty threshold (Bureau of the Census, 1993a).

[13]The Medicare values used in this article varied by state; the median state had a value of $3,253 for the aged (Bureau of the Census, 1993b). As an approximation, $3,000 is used in this and other examples.

[14]This scale was estimated using a set of consumer demand equations and data on expenditures from the 1972–73 Consumer Expenditure Survey (van der Gaag and Smolensky, 1982).

[15]That scale shows a male aged 35–54 with a scale value of 66 and an aged female with a scale value of 24. The aged nonaged differentials in this scale are considered by some analysts to be unreasonably large (Radner, 1992).

The relationship between noncash income and poverty measurement was the focus of a 1985 conference organized by the Bureau of the Census (1986). At that conference, Ward (1986) and Ellwood and Summers (1986) presented views about medical noncash income and medical needs that are of particular relevance to the example used in this article. Ward concluded that health care effectively was not included in the needs reflected in the official poverty thresholds and that it was necessary to use a consistent treatment of medical noncash income and needs. Ellwood and Summers concluded that, if medical noncash income were included in the definition of income, it would be essential to change the poverty thresholds to adjust for differences in medical needs since the aged and disabled had higher needs.[16]

The examples discussed above illustrate problems related to the lack of consistency between the resource and needs sides of the comparison, primarily at low levels of income. Illustrations of the possible importance of these problems in general assessments of the economic well-being of age groups using actual income data are presented next.

## III. Illustrative Estimates of the Relative Economic Status of the Aged

The discussions of noncash income, equivalence scales, and the relationship between the U.S. poverty thresholds and noncash income presented above can have important implications for the form of appropriate equivalence scales. The effects on the measured economic well-being of the aged of several different assumptions about the needs associated with the noncash income included in the income definition (Medicare noncash income in this case) are examined in this section.[17]

Several crude alternative adjustments for needs are described. Two of those adjustments take into account unmeasured needs associated with Medicare. Then the adjustments are applied to data on cash income and Medicare noncash income from the Current Population Survey (CPS) to obtain illustrative estimates of the relative economic status of the aged. Relative median incomes and ratios of aged to nonaged median incomes are shown.

The estimates presented in this section are merely illustrations and, because of the crude assumptions made, should not be considered precise estimates. The estimates are presented to show that different assumptions about needs associated with noncash income can produce substantial differences in estimates of the economic well-being of the aged.

### A. *Adjustments Compared*

Four treatments of different needs are applied to income data to assess the sensitivity of the measured economic well-being of the aged to the assumptions

[16]A recent report on the measurement of poverty, including the role of noncash income, placed great emphasis on the necessity of consistency between the definition of resources and the poverty thresholds used (Citro and Michael, 1995).

[17]Other types of noncash income, such as Medicaid, could have been used as examples. The assumptions required for needs associated with Medicaid are less satisfactory than those used here for Medicare.

used in those treatments. The four treatments are discussed in this subsection. Estimates of adjusted income produced by adjusting (dividing) income amounts by the equivalence scale values for those treatments are shown later in this section.

The first treatment consists of no adjustment to income amounts; this treatment will be referred to as UNADJ. This treatment assumes that all units have equal needs. The other three treatments are adjustments applied to income amounts and are expressed as equivalence scale values.

The first of these three adjustments considers only needs for cash income. The other two adjustments take needs associated with noncash income into account and are intended for use with noncash income types that have associated needs which are assumed to be missing from poverty threshold needs. Medicare noncash income is used with these adjustments to produce the estimates shown.

The first adjustment (POV) was derived from the official poverty thresholds.[18] The equivalence scale value for POV for a given family unit was the ratio of the cash needs of that unit at the poverty level to the cash needs of a base unit at the poverty level. The use of this scale with an income definition that includes noncash income implicitly assumes that needs associated with noncash income are already included in the official poverty thresholds (or more precisely that equivalence scale values are unchanged for all relevant groups when noncash income is added). We have argued earlier in this article that, at least in some cases, this is not a good assumption. The scale based on the official poverty thresholds has been used as an equivalence scale by many researchers directly, or indirectly as the denominator of a welfare ratio.[19]

The form of this adjustment is:

$$\text{POV}_i = \frac{p_i}{p_b}, \tag{1}$$

where $\text{POV}_i$ is the equivalence scale value for unit $i$, $p_i$ is the poverty threshold applicable to unit $i$, and $p_b$ is the poverty threshold for the base unit. This scale is applied at all income levels.

This equivalence scale was calculated using the 1992 weighted average poverty thresholds (Bureau of the Census, 1993a). The scale based on the official thresholds was modified to eliminate the age differential for 1- and 2-person units; the all ages values were used for units of those sizes. The base unit was a 1-person unit.[20,21]

The next adjustment (PNY) is based on POV, but PNY takes into account amounts of noncash income. The equivalence scale value for PNY for a given

[18]A different equivalence scale intended for use with cash income could have been used. The general pattern of the results would be expected to be similar to the pattern found here.

[19]A unit's welfare ratio is the ratio of the unit's cash income to the poverty threshold applicable to that unit.

[20]The scale used was: 1 person, 1.000; 2 persons, 1.279; 3 persons, 1.566; 4 persons, 2.007; 5 persons, 2.373; 6 persons, 2.679; 7 persons, 3.023; 8 persons, 3.367; 9 persons or more, 4.024. This modified version was used in order to simplify the calculations. It is assumed, for purposes of this example, that this equivalence scale provides an acceptable approximation of true relative needs when cash income is used.

[21]The poverty threshold for the base unit was $7,143. The thresholds used for other unit sizes can be found in Bureau of the Census (1993a) or can be calculated using the equivalence scale values.

family unit is the ratio of the cash needs plus the noncash needs associated with Medicare of that unit at the poverty level to the cash needs of the base unit at the poverty level. (The base unit is assumed to have no noncash income and therefore no needs associated with Medicare.)

Two strong assumptions used in this adjustment should be noted. First, for units with the included noncash income type, at the poverty level of living the amount of needs associated with that noncash income added to cash needs is assumed to be equal to the amount of the noncash income. It is assumed that the needs associated with the noncash income included in the definition of income are excluded entirely from the needs represented in the poverty thresholds.

Second, for those units without the noncash income type, no needs are added to total cash needs. That is, the absence of noncash income is assumed to imply the absence of the associated needs. Since only Medicare is added to cash income, this second assumption probably is not very important for the aged because only 3 percent of family units in that group do not receive Medicare and therefore do not have their extra medical needs added. For the nonaged (i.e. the disabled nonaged), however, this assumption is more likely to be important. The disabled nonaged who are not covered by Medicare do not have their extra medical needs added. These two strong assumptions (and the crudeness of the adjustment formulations used) limit the appropriate use of these estimates to the type of sensitivity analysis shown here.

The form of PNY is:

$$\text{PNY}_i = \frac{p_i + m_i}{p_b}, \tag{2}$$

where $m_i$ is the amount of the specific noncash income type (Medicare) included in the definition of income used. The numerator represents total needs of unit $i$ at the poverty level, and the denominator represents total needs of the base unit at the poverty level. This measure can be viewed as an analog of POV for the case in which needs associated with noncash income are added to needs associated with cash income.

In this formulation, $p_i$ represents needs associated with cash income at the poverty level (i.e. the amount of cash income that brings the unit up to the poverty level). The other part of the numerator, $m_i$, is the amount of needs associated with noncash income at the poverty level. As noted above, in PNY for unit $i$, those needs are assumed to be equal to the amount of noncash income of that type received by unit $i$, $m_i$. Like POV, this scale is applied at all income levels. When PNY is applied, for the case in which the definition of income is limited to cash, $m_i$ in PNY is zero.

The equivalence scale value for the final adjustment (PHNY) for a given family unit is the ratio of cash needs plus half the noncash needs associated with Medicare of that unit at the poverty level to the cash needs of the base unit at the poverty level. (As in the case of PNY, the base unit is assumed to have no noncash income and therefore no needs associated with Medicare.)

Two strong assumptions are also used in PHNY. The first is a modified version of the assumption used for PNY. In PHNY, it is assumed that for units

with the included noncash income type, at the poverty level of living the amount of needs associated with that noncash income added to cash income is half the amount of the noncash income. This assumption is merely meant for use in this article's sensitivity analysis. The interpretation of this assumption used here is that half of the needs associated with the noncash income already is included in needs associated with cash income. Thus, only half is unmeasured by needs associated with cash income, and that unmeasured half should be added.[22]

The second strong assumption is that, for those units without the noncash income type, no needs are added to total cash needs. This assumption is identical to the one used for PNY.

The form of this adjustment is:

$$\text{PHNY}_i = \frac{p_i + (m_i/2)}{p_b}. \tag{3}$$

As in the other adjustments, the numerator represents total needs of unit $i$ at the poverty level, and the denominator represents total needs of the base unit at the poverty level. Like POV and PNY, this scale is applied at all income levels. When PHNY is applied, for the case in which only cash income is used, $m_i$ in PHNY is zero.

In the context of the sensitivity analysis in this article, PHNY is a useful example because it is intermediate between POV and PNY. In POV, no needs associated with noncash income are added to cash needs. In PNY, the amount of noncash income is added to needs at the poverty level, and in PHNY half the amount of noncash income is added to needs at the poverty level. It should be noted that, for a given unit without noncash income, POV, PNY, and PHNY all have the same equivalence scale value.[23]

Table 1 shows selected equivalence scale values for the four treatments discussed here. The values for UNADJ and POV do not depend on the unit's amount of noncash income, while the values for PNY and PHNY do. In Case A, the unit is assumed to have no noncash income, while in Case B the unit is assumed to have $3,000 noncash income. For PNY and PHNY, the scale values are higher for Case B than for Case A because of the inclusion of needs associated with the noncash income. Income amounts are divided by the equivalence scale values to obtain the amounts of adjusted income used later in this section.

### B. *Data*

The data used in this article are from the March 1993 CPS. The CPS is conducted monthly by the Bureau of the Census; about 57,000 households were

[22]An alternative interpretation that produces the same results is that the needs associated with Medicare are equal to half the amount of Medicare income and that all of those needs are unmeasured and should be added.

[23]Smeeding *et al.* (1993) in their poverty estimates treated needs associated with noncash income (imputed rent, health care, and education) differently from those associated with cash income. The equivalence scale applied to cash income took account of unit size and adult–child differences. The scale applied to noncash income was the per capita scale. If their treatment of needs were applied to the problem discussed here, there would be a consistency problem because the needs associated with Medicare, and perhaps the needs associated with some other types of noncash income, would not be specified properly.

TABLE 1

EXAMPLES OF EQUIVALENCE SCALE VALUES

| Adjustment | Unit size | | | |
|---|---|---|---|---|
| | 1 person | 2 persons | 3 persons | 4 persons |
| UNADJ | 1.00 | 1.00 | 1.00 | 1.00 |
| POV | 1.00 | 1.28 | 1.57 | 2.01 |
| Case A | | | | |
| PNY | 1.00 | 1.28 | 1.57 | 2.01 |
| PHNY | 1.00 | 1.28 | 1.57 | 2.01 |
| Case B | | | | |
| PNY | 1.42 | 1.70 | 1.99 | 2.43 |
| PHNY | 1.21 | 1.49 | 1.78 | 2.22 |

*Notes*:
Case A: zero noncash income.
Case B: $3,000 noncash income for each unit.
Base unit: 1-person unit, zero noncash income.
*Definitions*:
UNADJ: No adjustment for differential needs.
POV: Scale based on the official poverty thresholds.
PNY: Scale based on POV, but including the noncash income amount.
PHNY: Scale based on POV, but including half the noncash income amount.
*Source*: Author's calculations.

interviewed in March 1993. The March survey each year contains information on cash income and several types of noncash income for the previous calendar year (Bureau of the Census, 1993b). All income data used in this article, both cash and noncash, were produced by the Bureau of the Census.

For Medicare noncash income, information on receipt of the type was collected in the survey, but income values were imputed. The value of Medicare used here was the market value (calculated on an insurance basis), which was imputed by taking mean government outlays per enrollee by State and risk class. (Bureau of the Census, 1993b). Although the estimating method used to obtain the noncash estimates can affect the equivalence scales that are appropriate, that is not the focus of this article. The specific method used to estimate noncash income, although a very important topic, is of lesser importance here.

Medicare noncash income was very important for the aged and unimportant for the nonaged. In 1992, the market value of Medicare amounted to 18 percent of cash income for the aged; 97 percent of aged units received that type. For aged units receiving Medicare, the mean amount was $4,500.[24] For the bottom cash income quintile of the aged, Medicare amounted to 62 percent of cash income, and the mean amount was about $3,700. Within the aged group, Medicare was more important for the older aged than for the younger aged, for both the age groups as a whole and for the bottom cash income quintiles. For the nonaged, Medicare amounted to only 1 percent of cash income. These estimates of the

[24]Mean cash income before tax (unadjusted for needs) was $35,200 for all family units, $24,200 for aged family units, and $38,000 for nonaged family units.

relative importance of Medicare noncash income show that the values are large enough to have an important impact on the measured economic well-being of the aged.

### C. *Relative Medians*

The estimates shown here are not intended to be precise estimates; rather they are best interpreted as illustrations of possible magnitudes involved using selected alternative adjustments. Estimates for two definitions of income—cash income before taxes (Cash), and cash income before taxes plus the market value of Medicare (Cash + Medicare)—are shown here. The focus is on the aged.

When cash income before taxes was used as the definition of income and no adjustment for needs (UNADJ) was applied, the age-income relationship was a familiar one. Median family unit income was relatively high in the middle age groups and relatively low at young and old ages (Table 2).[25]

TABLE 2

RELATIVE MEDIANS FOR ALTERNATIVE ADJUSTMENTS, FAMILY UNIT CASH INCOME, 1992

| Age of Householder | Adjustment | | | |
|---|---|---|---|---|
| | UNADJ | POV | PNY | PHNY |
| All ages | 1.00 | 1.00 | 1.00 | 1.00 |
| 65 and over | 0.62 | 0.72 | 0.72 | 0.72 |
| Under 25 | 0.44 | 0.52 | 0.52 | 0.52 |
| 25 34 | 0.98 | 0.98 | 0.98 | 0.98 |
| 35–44 | 1.34 | 1.15 | 1.15 | 1.15 |
| 45 54 | 1.55 | 1.41 | 1.41 | 1.41 |
| 55–64 | 1.18 | 1.23 | 1.23 | 1.23 |
| 65–74 | 0.73 | 0.82 | 0.82 | 0.82 |
| 75 and over | 0.49 | 0.60 | 0.60 | 0.60 |

*Definitions*:
UNADJ: No adjustment for differential needs.
POV: Scale based on the official poverty thresholds.
PNY: Scale based on POV, but including the noncash income amount.
PHNY: Scale based on POV, but including half the noncash income amount.

*Source*: Tabulations from the March 1993 CPS.

The application of POV produced shifts in the relative medians that were related to differences in unit sizes. The relative median for the 65 and over age group rose from 0.62 to 0.72 (a 16 percent increase), the value for the 65–74 age group rose from 0.73 to 0.82 (12 percent), and the value for the 75 and over group rose from 0.49 to 0.60 (22 percent). Among nonaged age groups, the under 25 and 55–64 age groups showed increases, while the 35–54 groups showed decreases. The general relationship among age groups still held: relative medians for the elderly were below those for ages 25–64. The other two adjustments—

[25]In the estimates in this article, each family unit was counted once, regardless of the number of persons in the unit. Sample weights were used in the tabulations. Also, negative amounts of total cash income were treated as zeros.

PNY and PHNY—by definition produce results identical to POV when only cash income is considered because in that case only cash needs are included.

When Cash + Medicare is used as the definition of income and the different adjustments are compared, there is a wide range of estimates for the aged (Table 3). Moving from UNADJ to POV raised the relative median of the 65 and over group from 0.75 to 0.87 (16 percent). The relative median of the 65–74 age group rose from 0.87 to 0.97 (11 percent) and the relative median of the 75 and over age group rose from 0.62 to 0.76 (23 percent). These changes resulted from the generally smaller unit size for the aged than for the nonaged (and for the old old than for the young old). The relative medians for the aged obtained using POV and Cash + Medicare are considered overestimates because the needs associated with Medicare noncash income are not taken into account. This is an example of the usual case in which there is a consistency problem.

TABLE 3

RELATIVE MEDIANS USING ALTERNATIVE ADJUSTMENTS, FAMILY UNIT CASH INCOME PLUS MARKET VALUE OF MEDICARE, 1992

| Age of Householder | Adjustment | | | |
|---|---|---|---|---|
| | UNADJ | POV | PNY | PHNY |
| All ages | 1.00 | 1.00 | 1.00 | 1.00 |
| 65 and over | 0.75 | 0.87 | 0.63 | 0.73 |
| Under 25 | 0.42 | 0.50 | 0.56 | 0.53 |
| 25–34 | 0.94 | 0.94 | 1.03 | 0.99 |
| 35–44 | 1.29 | 1.11 | 1.22 | 1.17 |
| 45–54 | 1.49 | 1.36 | 1.49 | 1.44 |
| 55–64 | 1.15 | 1.20 | 1.27 | 1.24 |
| 65–74 | 0.87 | 0.97 | 0.71 | 0.82 |
| 75 and over | 0.62 | 0.76 | 0.55 | 0.64 |

*Definitions*:
UNADJ: No adjustment for differential needs.
POV: Scale based on the official poverty thresholds.
PNY: Scale based on POV, but including the noncash income amount.
PHNY: Scale based on POV, but including half the noncash income amount.

*Source*: Tabulations from the March 1993 CPS.

Moving from POV to PNY produced large shifts. The relative median of the 65 and over age group fell from 0.87 to 0.63 (28 percent), the relative median of the 65–74 age group fell from 0.97 to 0.71 (27 percent), and the relative median of the 75 and over group fell from 0.76 to 0.55 (28 per cent). These substantial declines resulted from the large increases in needs (i.e. the needs associated with noncash income) in moving from POV to PNY.

Finally, the shift from PNY to PHNY produced smaller, but still substantial, changes. The relative median of the 65 and over age group rose from 0.63 to 0.73 (16 percent), the relative median of the 65–74 age group rose from 0.71 to 0.82 (15 percent), and the relative median of the 75 and over age group rose from 0.55 to 0.64 (16 percent). These increases resulted from the decreases in added needs associated with noncash income when the adjustment was shifted from PNY to PHNY.

It is also useful to examine the changes in relative medians for the same adjustment when Medicare was added to the definition of income. Using POV, the addition of Medicare to the definition of income raised the relative median of the 65 and over group from 0.72 to 0.87 (21 percent) (Tables 2 and 3). The relative median of the 65–74 group increased from 0.82 to 0.97 (18 percent) and the relative median of the 75 and over age group rose from 0.60 to 0.76 (27 percent). These shifts occurred because the aged received more income from Medicare than the nonaged and there was no change in the adjustment for needs. (Those percentage differences were the same when UNADJ was used and Medicare was added to the definition of income.)

When PNY was used and Medicare was added to the definition of income, the relative median of the 65 and over age group fell from 0.72 to 0.63 (12 percent), the relative median of the 65–74 age group fell from 0.82 to 0.71 (13 percent), and the relative median of the 75 and over age group fell from 0.60 to 0.55 (8 percent). These declines occurred because, for these age groups, the percentage increase in needs more than offset the percentage increase in income.[26] When cash income is above the poverty threshold, that is the expected outcome using PNY. The decline was smaller for the old old than for the young old because the old old generally have lower cash income relative to the poverty threshold.

When PHNY was used and Medicare was added to the definition of income, the relative median of the 65 and over age group rose slightly from 0.72 to 0.73 (1 percent). The relative median of the 65–74 age group was 0.82 in both cases, and the relative median of the 75 and over group rose from 0.60 to 0.64 (7 percent). Since the level of needs was not increased as much using PHNY as using PNY, the relative medians using PHNY rose slightly or remained the same, rather than falling as occurred using PNY. These changes, which are relatively small, are the same as changes from POV and Cash to PHNY and Cash + Medicare because when Cash is used, estimates using POV and estimates using PHNY are the same (Table 2).

Differences among the estimates can be summarized by examining the ratio of aged to nonaged median incomes for each combination of adjustment and definition of income (Table 4). For Cash, the ratio was 0.55 for UNADJ and 0.66 for the other three measures. The ratio for the other three measures was 20 percent higher than the ratio for UNADJ. For Cash + Medicare, the ratios ranged from 0.55 for PNY to 0.83 for POV; the lowest ratio was only 66 percent of the highest.

When income was not adjusted (UNADJ), the ratio rose from 0.55 for Cash to 0.69 for Cash + Medicare, an increase of 25 percent. For POV, the ratio rose 26 percent, from 0.66 to 0.83, when Medicare was added to the definition of income. For PNY, the ratio fell 17 percent, from 0.66 to 0.55, and for PHNY, the ratio was unchanged at 0.66 when Medicare was added to the definition of income.

[26]A comparison of cash income and total needs (including needs associated with Medicare) can also be made. When income was defined as Cash and PNY including needs associated with Medicare was used as the adjustment, the relative median of the 65 and over age group was only 0.52. Thus, when needs (including needs associated with Medicare) were held constant, adding Medicare to income raised the relative median of the 65 and over age group from 0.52 to 0.63.

TABLE 4

RATIO OF AGED TO NONAGED MEDIAN INCOMES USING ALTERNATIVE DEFINITIONS OF INCOME AND ADJUSTMENTS, 1992

| Adjustment | Definition of Income | |
|---|---|---|
| | Cash | Cash + Medicare |
| UNADJ | 0.55 | 0.69 |
| POV | 0.66 | 0.83 |
| PNY | 0.66 | 0.55 |
| PHNY | 0.66 | 0.66 |

*Definitions*:

UNADJ: No adjustment for differential needs.
POV: Scale based on the official poverty thresholds.
PNY: Scale based on POV, but including the noncash income amount.
PHNY: Scale based on POV, but including half the noncash income amount.

*Source*: Tabulations from the March 1993 CPS.

Compared with UNADJ, using POV raised the ratio by about 20 percent for both definitions of income. Moving from POV to PNY decreased the ratio for Cash + Medicare by 34 percent, from 0.83 to 0.55, and moving from PNY to PHNY increased the ratio for Cash + Medicare by 20 percent, from 0.55 to 0.66.

Two important points are shown by the sensitivity analysis in this section. First, the common type of estimate made using POV and Cash + Medicare, a type that is affected by the consistency problem, produces a substantial overestimate of the relative status of the aged. Second, the range of estimates for the aged is quite large—the values for POV using Cash + Medicare are substantially higher than for PNY. Even though those estimates are flawed—the relative medians for the aged using POV and Cash + Medicare are considered to be biased upward and PNY is a very crude adjustment that produces relative medians for the aged that could be too low—these illustrative results suggest that there is substantial uncertainty about the true relative position of the aged.

## IV. SUMMARY AND CONCLUSIONS

In this exploratory article it was shown that a lack of consistency between the definitions used on the income and needs sides in comparisons of economic well-being can be important for the assessment of the economic well-being of subgroups of the population. The same equivalence scale usually is applied to different definitions of resources. This use is generally inappropriate conceptually and is likely to be an important problem empirically in at least some important cases. Most equivalence scales have been formulated or estimated for use with cash income. Such scales may not be appropriate for a definition of income that includes noncash income because of needs associated with that noncash income that are unmeasured in those scales.

This article presented an example of this general consistency problem: the economic well-being of the aged and the role of Medicare noncash income. Illustrations of the effects on the relative economic well-being of the aged produced by two crude modifications to an equivalence scale based on the U.S. poverty thresholds were presented. Those modifications accounted for the presence of unmeasured medical needs associated with Medicare noncash income. Household survey income data from the CPS were used in those illustrations. The estimates presented should not be considered as satisfactory estimates of the economic well-being of the aged, but only as examples. The conclusion is that the usual measures that include both cash and noncash income but take only cash needs into account tend to overestimate the economic status of the aged, but the amount of overstatement, although it is likely to be substantial, is not known.

The example discussed in this article is limited in several important ways. Looking only at Medicare noncash income is a partial analysis. Some other noncash income types, such as Medicaid and education subsidies, that have been included in definitions of income by various researchers in many cases have unmeasured needs associated with them. Research into which other types of noncash income might have unmeasured needs associated with them is needed.

In some cases, unmeasured needs associated with noncash income types other than Medicare could offset, at least to some degree, the unmeasured needs associated with Medicare. For example, education subsidies are received disproportionately by young families; therefore, income relative to needs would be overstated for that group if the unmeasured needs are omitted.[27] The measured relative status of groups that receive neither Medicare nor education subsidies would probably be biased. Thus, offsetting errors are not likely to remove the effects of inconsistency. The importance of the consistency problem in cases in which more types of noncash income are included should be examined.

The analysis of the example is confined to the effects on age groups. Further analyses should examine the effects on other subgroups. Also, the strong assumptions regarding the relationship between amounts of noncash income and amounts of the associated needs added to cash needs should obviously be improved upon. The role of the valuation of noncash income types should be explored in this context. In addition, the appropriate equivalence scale could differ by income level. That possibility should be explored.

Perhaps the method for valuation of noncash income proposed by Wolfe and Moffitt (1991) could provide a useful direction for obtaining better and consistent estimates of needs. Their method is related to an insurance value method, with the values specific to the person or unit and with such factors as health status taken into account. Perhaps a needs measure based on their valuation method could be constructed and used in conjunction with their valuation of noncash income. Wolfe and Moffitt warned against use of their valuation method for comparisons of economic well-being across subgroups primarily because differences in needs affect the valuation. For example, those in poor health were assigned

[27]Smeeding *et al.* (1993) included education subsidies, net of property taxes, in their analysis. They concluded that the aged are not relatively as well off as previous studies (that included medical noncash income but not education noncash income) had found.

a higher valuation of medical noncash income. The use of a consistent estimate of needs could eliminate this problem.

Although this article is exploratory, the discussion and results suggest several general conclusions about appropriate methods. When noncash income is included, the income definition should be taken into account in the choice of the equivalence scale. Particularly for subgroups of the population that are of importance to the analysis being performed, the researcher should consider whether a specific equivalence scale is appropriate, given the definition of income used. Readers should be warned when there is a possible problem resulting from inconsistency.

When it is feasible, a solution is to estimate equivalence scales that are consistent with the definition of income used. In other cases, results could be presented using several alternative equivalence scales to reflect uncertainty regarding the proper scale. That is sometimes done now, but the alternative scales generally reflect only differences in economies of scale associated with unit size. When results using alternative scales are shown, it is important to include scales that incorporate unmeasured needs associated with the noncash income included.

The true effects of adding Medicare noncash income (and therefore probably all medical noncash income types) are sufficiently uncertain that medical noncash income types generally should be excluded from income, at least until better measures of relative needs can be developed. The potential for misleading results is substantial if an inappropriate equivalence scale is used. At a minimum, estimates should be shown with and without the inclusion of medical noncash income. This is sometimes done at the present time.

This exploratory article has only scratched the surface of the problem of a lack of consistency between the specifications of resources and needs. The principal purpose of the article is to make the point that we need to pay more attention to this consistency problem. The effects of the consistency problem are likely to be important in many cases. Those effects should be explored and not merely assumed to be insignificant. Further exploration of the magnitudes of differences among alternative adjustment methods is warranted by the results shown here. Although this article focused on a specific example, the basic problem is not confined to the treatment of Medicare or to the U.S., but is much broader in nature.

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