HOUSEHOLD INCOME AND POVERTY STATISTICS UNDER ALTERNATIVE MEASURES OF HOUSEHOLD AND FAMILY COMPOSITION*

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INTRODUCTION

Traditionally, the distribution of income and economic well-being and the incidence of poverty among households, families and persons in the United States have been measured within an annual time frame. From the standpoint of smoothing out seasonal and other short term fluctuations in income, an annual time frame is believed to confer significant advantages over shorter durations, although the extent of these advantages is not well documented. However, there exists an ultimate incompatibility between the theoretical concept of annual household or family income and the reality of changing household composition. For households forming or dissolving during a particular year, annual income does not really exist. For households gaining or losing members, the interpretation of income received over the course of the year is problematic.

There are no direct estimates of how many families typically experience change in composition over the course of a year. However, demographic data on the incidence of births, deaths, marriages and divorces and the size of the postadolescent population suggest that perhaps 30 percent of the households observed in the March Current Population Survey (CPS) will have undergone some kind of change in composition since the beginning of the previous calendar year. How annual income equivalents are constructed for these households, therefore, weighs heavily in the overall validity of annual household income statistics.

BACKGROUND

There is no consensus on an ideal annual income equivalent for households and families that change composition during the income reference year. In fact, most researchers and policymakers who use annual income and poverty statistics probably have never given the matter a second thought. Among those who have explored the issue, the proposals for alternative annual income measures are quite varied.

We may distinguish between micro and macro approaches. A micro approach seeks to devise a measure that will accurately reflect the income experience of each family or household in the sample. Proposals of this type range from annualizing the part-year income of part-year families to complex procedures for assigning family income shares to individual persons and aggregating each person's shares from different families over the course of the reference year. All of the micro approaches require subannual income and family composition data, collected either retrospectively or longitudinally. A macro approach foregoes accuracy at the micro level in favor of producing meaningful income and family aggregates. With the right kind of measure, it is theoretically possible that errors at the

micro level will negate each other and not distort the estimated family income distribution.

Annual income as measured in the March CPS reflects the macro approach. Household and family income are constructed by summing the previous calendar year income of all persons present in the unit at the survey date, regardless of how briefly they may have lived with that unit. The families and households counted in this manner have a direct interpretation: their distribution by size and other demographic characteristics corresponds to a distribution that actually existed at a specific point in time. Their total income represents the total personal income of household members alive at that same point in time.

At the micro level, however, this method has obvious failings. Consider two hypothetical examples. In one case, a husband and wife who were together during the survey reference year separate prior to the survey date. If the wife did not work during the reference year, she will be assigned an annual income of zero and counted as a poor household, when that was clearly not her situation during the reference year and may not be her situation at the survey date either. In another case, a woman who lived on a poverty income during the reference year marries a man with a much larger income. As a couple, they are assigned an annual income well above the poverty line, which misrepresents the prior status of the woman.

Whether the CPS annual income measure accurately reflects the true distribution of family income and, in particular, the incidence of poverty, depends on whether errors of the first type and errors of the second type balance each other out. Even if such errors do balance out over the whole sample, there exists a potential for serious bias in the estimates of income among different types of households.

Until the Income Survey Development Program (ISDP) fielded its 1979 Research Panel, there did not exist subannual, longitudinal data adequate to investigate bias in CPS-type annual income. When the full six-wave linked file from the 1979 Panel becomes available for analysis, it will provide a unique opportunity for comparative evaluation of several alternative approaches to defining and measuring household and family income. In the meantime, limited analysis has been possible with the early waves of the survey.

This paper presents the results of a study based on the first two waves. The first quarter income of households observed at the Wave I interview is contrasted with the first quarter income of households defined by their composition at the Wave II interview, three months later. More specifically, the first quarter income of each Wave I household is

defined as the sum of the three-month incomes of the persons living in that household at the time of the Wave I interview. The corresponding income of each Wave II household is defined as the sum of the Wave I incomes of persons living in that household at the Wave II interview. In short, the study asks how changes in household and family composition over the three-month period between the Wave I and Wave II interviews affect the allocation of income among households. The findings shed light on the distortion that can develop in household and family income statistics when the income assigned to individual households or families does not reflect the true composition of those units during the reference period.

HOUSEHOLD COMPOSITION CHANGE AND MEAN INCOME

Table 1 presents a detailed decomposition of the ISDP sample in Waves I and II with respect to types of household composition change observed. Weighted and unweighted counts are reported, and the mean income (annualized) of each component is recorded as well. The weights are cross-sectional rather than longitudinal. After the initial assignment of weights for Wave I, the households were reweighted to adjust for attrition and gains to the sample between Waves I and II and to bring the totals into line with Wave II controls. For a longitudinal analysis this is not ideal, as certain components that were in fact stable between the two waves may be forced to change size.

Attrition between the first two waves was fairly sizable: 8.5 percent of all sample households left the sample entirely. Another 1.5 percent of sample households lost part of their membership. Partially compensating for this attrition was the pick-up in Wave II of a number of households that were part of the Wave I sample but were not interviewed. These accounted for nearly 3 percent of the total Wave II sample.

In the bottom line of the table we observe a decline in the weighted mean income of households between Waves I and II. This follows our expectation. The total Wave I income of the universe sampled by ISDP should be fairly similar for our two measures. Some decline will occur as a result of mortality and other exits from the universe. New entrants to the universe between Waves I and II were not sampled by ISDP. The total number of households, on the other hand, increases at an annual rate of 3 percent, following its trend in recent years. Mean income declines because the denominator grows more rapidly than the numerator, imparting a downward bias. A downward bias of this same type is present in CPS annual income statistics.

The decline in mean income observed in table 1 reflects in roughly equal parts the expected growth in the number of households and a drop in aggregate reported income. Apparently, the reweighting of the sample in Wave II did not fully compensate for the income effects of attrition from households that remained in the sample. Reweighting did compensate for the income effects of the attrition and addition of complete households.

Perhaps the most significant statistic in the table is the estimated 7 percent of Wave II households (weighted) that experienced a change in composition between Waves I and II. This figure is consistent with the indirect estimate of 30 percent cited earlier and confirms that household composition changes are indeed experienced by a large proportion of all households each year. Table 1 breaks down the type of composition change recorded and shows the associated mean income. Wave I and Wave II counts of households by type of change differ, and the magnitudes of the differences vary by type. Some changes increase the total number of households while others diminish the total number; the reweighting of households between waves translates the sample changes into appropriate representations of the total population. Reweighting also adds roughly 5 percent to each category to compensate for attrition.

Viewed from Wave I, the most frequent change in composition consisted of the acquisition of new adult members: 2.56 percent of the weighted Wave I households experienced such change. The next most frequent type of change consisted of the loss of members who were not retained in the sample: 1.68 percent of the Wave I households changed in this manner. Most such changes presumably involved split-offs who remained part of the ISDP universe but either moved more than 50 miles from a primary sampling unit or could not be traced. Fewer than a quarter of these 1.68 percent will have lost adult members through mortality. Households that split into two or more households, with no additions or losses of members, amounted to .77 percent of the Wave I total. Households experiencing multiple changes amounted to .99 percent of the Wave I total: .83 percent divided into two or more households with at least one segment gaining new members; .08 percent divided but also suffered attrition; and another .08 percent gained and lost members.

Households that changed composition showed a sizable drop in mean income between Waves I and II: from $22,074 to $17,194 (weighted). The decline is much larger here than for households as a whole because virtually all of the decline in mean income over the total population is necessarily concentrated among households that changed composition.

DISTRIBUTIONAL EFFECTS

Differences in mean household income reveal only a limited part of the effect of household composition change on the Wave I income of Wave II households. A comparison of the distributions of income among Wave I and Wave II households experiencing change is considerably more informative.

Weighted distributions of annualized Wave I income are presented in table 2. A comparison of the cumulative percentage columns shows a strikingly higher incidence of low income among Wave II than Wave I households. Nearly 10 percent of the Wave II households had annualized incomes below $2,000, compared to a little more than 1 percent of the Wave I households. With one exception, each income category up to $8,000

TABLE 1

MEAN WAVE I INCOME FOR WAVE I AND WAVE II HOUSEHOLDS, BY TYPE OF HOUSEHOLD COMPOSITION CHANGE

Household Category	Unweighted						Weighted					
	Wave I			Wave II			Wave I			Wave II		
	Mean Income	Category N	Size %	Mean Income	Category N	Size %	Mean Income	Category N	Size %	Mean Income	Category N	Size %
							(Weighted N's represent thousands of households)					
Whole Households that Entered or Left the Sample												
Attrition	$17,915	640	8.54	-----	------	-----	$18,134	6,560	8.17	-----	------	-----
Wave I non-interviews[a]	------	------	-----	$14,166	203	2.82	------	------	-----	$11,447	2,292	2.83
Households that Changed Composition	24,514	445	5.94	20,008	593	8.23	22,074	4,825	6.01	17,194	5,656	6.99
Simple Changes												
Subdivided households[b]												
With no attrition	26,404	57	0.76	13,246	114	1.58	24,034	622	0.77	12,190	1,342	1.66
With attrition	35,643	4	0.05	12,602	8	0.11	24,443	52	0.06	7,414	116	0.14
Households that lost adult members	30,646	112	1.49	21,584	112	1.55	27,816	1,346	1.68	18,613	1,448	1.79
Households that gained adult members												
New sample members	17,622	140	1.87	22,236	140	1.94	14,013	1,581	1.97	17,799	1,102	1.36
Wave I non-interviews	24,601	33	0.44	26,013	33	0.46	20,945	294	0.37	22,528	291	0.36
Aged child[c]	28,339	22	0.29	29,217	22	0.31	32,273	177	0.22	33,069	191	0.24
Complex changes												
Subdivision, with one segment gaining new member and one not	30,038	59	0.79	19,751	122	1.69	26,832	616	0.77	18,111	989	1.22
Subdivision, with all segments gaining new members												
With no attrition	14,762	8	0.11	15,078	16	0.22	19,129	51	0.06	15,912	49	0.06
With attrition	14,512	1	0.01	34,320	2	0.03	14,512	18	0.02	33,649	13	0.02
Split-offs from households with no net change[d]												
Simple split-offs	------	------	-----	9,568	8	0.11	------	------	-----	11,498	43	0.05
Split-offs with new members	------	------	-----	12,100	7	0.10	------	------	-----	6,963	55	0.07
Households that gained and lost members[e]	21,533	9	0.12	37,936	9	0.12	15,978	66	0.08	30,749	19	0.02
Total Households that Entered, Left or Changed	20,622	1,085	14.47	18,518	796	11.04	19,804	11,385	14.19	15,537	7,948	9.83
Stable, Continuing Households	19,891	6,411	85.53	19,938	6,412	88.96	18,866	68,874	85.81	19,066	72,918	90.17
Total Households	19,997	7,496	100.00	19,781	7,208	100.00	18,999	80,259	100.00	18,719	80,866	100.00

SOURCE: Computed by Mathematica Policy Research from the 1979 ISDP Research Panel.

[a] These are households that were interviewed in Wave II but not Wave I and were assigned person numbers in the 100s, indicating that they were present during Wave I. Such households were apparently part of the Wave I sample but, for some reason, were not interviewed at that time. Under the sample design, new persons could enter the sample only by joining households or persons already in the sample. Whole new households could not enter the area frame sample.

[b] These are households that simply split into two households each and did not add any new members. Among the households with no attrition, the unweighted mean Wave II income should equal exactly one half the mean Wave I income (because the total income should not change). The discrepancy seen here is apparently the result of a child's income being counted in one Wave II household but not the corresponding Wave I unit.

[c] Because we measured change in composition by a net change in the number of adult household members, a household could "grow" if a child of age 15 in Wave I celebrated a birthday before the Wave II interview. We included such households here only if they experienced a change in income as a result of the child's Wave I income becoming eligible for counting.

[d] This classification is an artifact of the algorithm we used to identify households that changed composition. If a household divided into two or more parts and the portion continuing in the same housing unit added enough new members to compensate for the loss of the former members, then the household was not identified as having changed composition (it appears among the "stable" households in the table). The split-offs do get counted as changed households in Wave II, however. If the seemingly stable household moved to another housing unit (or was assigned a new ID number as if it _had_ moved), then both the original Wave I and derivative Wave II households were classified as changing composition.

[e] This category comprises households from which members left the sample (i.e., they were not followed as split-offs) but which also gained new members.

TABLE 2

DISTRIBUTION OF WAVE I ANNUALIZED INCOME AMONG
WAVE I AND WAVE II HOUSEHOLDS THAT CHANGED COMPOSITION
(thousands of households)

Income Category	WAVE I HOUSEHOLDS			WAVE II HOUSEHOLDS		
	N	%	Cumulative %	N	%	Cumulative %
Zero	9	0.19	0.19	162	2.86	2.86
$1-999	7	0.15	0.34	231	4.08	6.94
$1,000-1,999	37	0.77	1.11	158	2.79	9.73
$2,000-2,999	164	3.40	4.51	285	5.04	14.77
$3,000-3,999	124	2.57	7.08	106	1.87	16.64
$4,000-4,999	137	2.84	9.92	200	3.54	20.18
$5,000-5,999	78	1.62	11.54	108	1.91	22.09
$6,000-6,999	116	2.40	13.94	234	4.14	26.23
$7,000-7,999	188	3.90	17.84	292	5.16	31.39
$8,000-8,999	159	3.30	21.14	114	2.02	33.41
$9,000-9,999	212	4.39	25.53	189	3.34	36.75
$10,000-12,499	449	9.31	34.84	510	9.02	45.77
$12,500-14,999	498	10.32	45.16	577	10.20	55.97
$15,000-17,499	385	7.98	53.14	603	10.66	66.63
$17,500-19,999	259	5.37	58.51	207	3.66	70.29
$20,000-24,999	420	8.70	67.21	460	8.13	78.42
$25,000-29,999	390	8.08	75.29	383	6.77	85.19
$30,000-34,999	335	6.94	82.23	186	3.29	88.48
$35,000-39,999	330	6.84	89.07	269	4.76	93.24
$40,000-44,999	89	1.84	90.91	83	1.47	94.71
$45,000-49,999	100	2.07	92.98	30	0.53	95.24
$50,000-59,999	152	3.15	96.13	155	2.74	97.98
$60,000-74,999	114	2.36	98.49	69	1.22	99.20
$75,000+	71	1.47	99.96	49	0.87	100.07
Total	4,825	100.00	100.00	5,657	100.00	100.00
Median		$16,516			$13,537	

SOURCE: Computed by Mathematica Policy Research from the 1979 ISDP Research Panel.

NOTE: N's are weighted. Categories may not sum to totals because of rounding.

shows an excess of low income households in Wave II. Cumulating these differences, 17.8 percent of Wave I households but 31.4 percent of Wave II households have incomes below $8,000.

Differences are evident at the upper tail of the distribution as well: 25 percent of Wave I households but only 15 percent of Wave II households have Wave I incomes about $30,000.

EFFECTS BY HOUSEHOLD TYPE

One of the concerns expressed earlier about the CPS annual income concept is that error at the micro level might cumulate in such a way as to bias comparisons among types of households. Table 3 addresses this issue in the context of our comparison of Wave I income among Wave I and Wave II households. The table presents summary statistics describing the Wave I income distributions among total Wave I and Wave II households, by Census household type.

Not surprisingly, the income of husband-wife households is essentially unaffected by the use of Wave II versus Wave I household composition. All four other types show substantially more very low income households (i.e., below $2,000) under Wave II than Wave I composition. But for female headed households-- family or non-family--there are no other differences of note. Only for male headed family households are any of the other differences particularly striking, and that household type represents only about 2 percent of all households (which implies large standard errors in the ISDP sample). Thus, it appears that the household composition changes which we have documented do not seriously distort the distribution of income among households by broad Census type. There was even less evidence of distortion by household size (not shown here).

TABLE 3

SUMMARY STATISTICS ON THE DISTRIBUTION OF WAVE I INCOME (ANNUALIZED)
AMONG HOUSEHOLDS AS CONSTITUTED AT WAVE I VERSUS WAVE II INTERVIEW, BY HOUSEHOLD TYPE

Summary Income Statistic	Family Households						Non-Family Households				All Households	
	Husband-Wife		Female Head		Male Head		Male Head		Female Head			
	Wave I	Wave II	Wave I	Wave II	Wave I	Wave II	Wave I	Wave II	Wave I	Wave II	Wave I	Wave II
Mean	$22,860	$22,822	$13,962	$13,896	$16,443	$14,282	$14,839	$13,621	$9,061	$8,868	$18,999	$18,719
Quartiles												
25%	12,327	12,191	5,643	5,654	6,438	5,582	6,458	5,925	3,810	3,628	8,219	8,001
50%	19,635	19,457	9,763	9,725	13,091	8,835	11,042	10,615	6,489	6,258	15,321	14,970
75%	29,095	28,821	15,469	15,145	22,451	19,333	19,924	18,768	11,171	11,050	24,924	24,556
Absolute Levels												
Below $2,000	1.9%	2.0%	4.9%	7.0%	3.4%	6.4%	3.7%	7.1%	4.9%	6.8%	2.8%	3.8%
Below $8,000	11.7	11.6	35.5	36.9	38.2	42.8	35.4	39.4	59.8	60.8	24.1	25.0
Above $30,000	23.1	22.6	7.3	6.6	16.5	11.4	7.4	7.4	3.3	2.8	16.9	16.2
Above $60,000	2.9	3.0	0.4	0.5	0.5	0.8	0.7	0.4	0.2	0.2	2.0	2.0
Number of Households	50,877	50,746	7,333	7,624	1,659	1,663	8,208	8,653	12,182	12,179	80,259	80,866

SOURCE: Computed by Mathematica Policy Research from the 1979 ISDP Research Panel.

NOTE: Numbers of households are weighted counts in thousands.

FAMILIES AND PERSONS IN POVERTY

Having seen that the use of Wave II household composition with Wave I income appears to overstate the number of very low income households, we now ask whether this effect extends to the number of families below the poverty line. Poverty thresholds take into account family size and certain other characteristics, so the proportion of families below their respective poverty thresholds is a better indicator of economic hardship than the proportion of families below a certain absolute dollar amount.

A comparison of Wave I poverty rates for Wave I and Wave II households is presented in table 4 for families and total persons. Poverty status is determined by a comparison of the quarterly income of each family with one-fourth the appropriate Social Security Administration annual poverty threshold for 1979. Total persons in poverty is the number of persons living in designated poverty families.

Based on Wave I family composition (CPS Revision), 13.2 percent of families and 11.8 percent of all individuals were estimated to have been in poverty. If Wave I income is assigned according to Wave II family composition, 14.4 percent of families and 12.9 percent of all individuals appear to have been in poverty. In each case, using Wave II composition adds more than a percentage point to the poverty rate.

We cannot determine how much of this difference is the direct effect of family composition changes per se and how much is an artifact of the incomplete tracking of split-offs. It is possible, for example, that some poverty families have been weighted too heavily as part of the adjustment for such attrition. On the other hand, it is also possible that because of this attrition we are undercounting the number of Wave II families whose composition implies Wave I incomes below the poverty line.

The third row of the table presents poverty estimates based on Wave II income and family composition. These rates are markedly higher than either set of rates based on Wave I income. We had hoped to use these results to determine to what extent the Wave II sample might be overrepresenting poor families rather than portraying the true effects of family composition change. However, there is evidence elsewhere that income reporting in Wave II was significantly less complete than in Wave I, so the figures should not be compared to the first two rows.

CONCLUSION

Our analysis of income data from the first two waves of the ISDP 1979 Panel suggests that household and family composition change generates excess estimates of low income households and persons and families in poverty when the first quarter income of all individuals is assigned to their households and families three months later. It is difficult to extrapolate from the results reported here what the cumulative effect might be over the course of a year, when perhaps four times as many households may have experienced changes in

TABLE 4

ALTERNATIVE ESTIMATES OF PERSONS AND FAMILIES
AT OR BELOW THE POVERTY LINE, EARLY 1979
(thousands of persons and families)

Source of Estimate	Number	Poverty Rate
	Persons	
CPS Replication (Wave II Composition, Wave I Income)	28,440	12.87%
CPS Revision I (Wave I Composition, Wave I Income)	26,050	11.80%
CPS Revision II (Wave II Composition, Wave II Income)	32,403	14.66%
	Families	
CPS Replication	12,240	14.44%
CPS Revision I	11,118	13.17%
CPS Revision II	13,609	16.05%

SOURCE: Computed by Mathematica Policy Research from the 1979 ISDP Research Panel.

NOTE: Numbers and rates are weighted.

composition. Apart from the conceptual differences in going from a quarterly to an annual time frame, the fairly small sample of composition changes on which our results are based plus the confounding influence of changes in the composition of the ISDP sample between the two waves lend considerable uncertainty to the estimated magnitudes of household composition effects.

Nevertheless, the results make a strong case for further analysis once the six-wave linked file becomes available. This paper has identified a number of methodological problems that will have to be addressed in such an analysis.