Measuring labor force flows: a special conference examines the problems

A large number of persons move into and out of the labor force and to and from employment and unemployment each month, but measurement of these flows is difficult; labor force experts and statisticians gathered to discuss the problems and suggest solutions

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Evidence accumulated in recent decades indicates that the American labor market is very dynamic, with millions of persons entering and leaving it each month. In addition, large flows are known to occur strictly within the labor force, as many workers move from employment to unemployment and vice versa. However, the volume of these flows—which are largely offsetting—cannot be determined from the data published monthly on the size of the labor force and its principal components. The statistics published monthly are "stock" measurements, which tell us only what "net" changes, if any, there have been in the levels of employment and unemployment, in the counts of persons outside the labor force, and in the various components of each of these groups.

To determine how many persons are flowing back and forth among these groups each month—regardless of what happens to the size of the groups—one must dig deeper and turn to special data on "gross" flows. Unfortunately, these data have proven difficult to analyze and explain and have been little used. As a result, we know little about the exact size of the *gross* monthly changes which lie behind the ups and downs in our widely used labor force statistics.

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Although little used, statistics on gross labor force flows have been tabulated in considerable detail for decades. They have been derived from the same source—the Current Population Survey (CPS)—which provides the monthly "stock" measurements of the labor force and its principal components. These gross flow (or gross change) tabulations indicate, among other things, how many persons join the ranks of the jobless each month and what their status was the previous month (that is, employed or not in the labor force). Likewise, they also show how many persons leave the ranks of the unemployed each month and what their labor force status is the following month.

To provide a simple illustration of the analytical potential of these data, take a hypothetical month when the published data (stock measurements) may show a net decline of 100,000 in unemployment, say from 5.0 million to 4.9 million. The gross flow tabulations, which indicate how much turbulence lies behind this change, may show it as having taken place in a climate of relative stability, say with 300,000 persons leaving unemployment and 200,000 entering it. On the other hand, the data may show a much higher degree of turnover, with 3.0 million persons leaving unemployment and 2.9 million persons becoming newly unemployed. Especially for policy purposes, it is most useful to know what proportion of the persons who are unemployed in a given month are also jobless the following month, what proportion find

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jobs, and what proportion leave the labor force. The actual gross flow statistics generally have been showing very large movements into and out of unemployment—even in periods when regular published data have shown only modest net changes in the level and rate of joblessness. But there are problems with the numbers.

The main problem with the gross flow statistics from the CPS—and the main reason why they have been used so little—is that they generally show movements into and out of the various labor force categories which, when balanced out, do not yield the same net changes as are shown by the published data. What is even more disturbing is the fact that the net changes that one may derive from the gross flow statistics have often differed from the official net changes not only in magnitude, but even direction, or sign.[1]

There are two principal reasons for the discrepancies between the published data and gross flow tabulations. The most important reason is that the flow calculations must be limited to only a subset of the CPS—the persons whose labor force status has been determined for at least 2 consecutive months (a proportion that can never exceed three-fourths of the sample). Because there are some small but systematic differences between the labor force behavior reported by these persons and that reported by the entire sample (these differences are discussed later), it is unavoidable that there will also be some systematic differences between the net changes implicit in the gross flow data and those derived from the published stock data. A second reason for the differences is that a variety of problems which will always be present to some extent in a survey as large as the CPS— response variability, nonresponses, mover effects, coding errors, and so forth—have a much greater impact on the gross flow data than they have on the stock measurement. In any case, the consensus is that the gross flow data as computed from the CPS tend to overstate the actual amount of movements, and that they seem to do so particularly in terms of the flows out of the labor force.

Evidence of this inconsistency problem was discovered long ago, and, primarily because of it, publication of the gross flow statistics was actually suspended for three decades beginning in 1953. While the data remained available to researchers, and while their publication has now been resumed on an annual basis,[2] their use is still handicapped by the problems noted above. To address these problems and to seek some viable solutions, the Bureau of Labor Statistics and the Bureau of the Census convened a special conference of labor force experts and statisticians in 1984. This article summarizes the results of this conference, but first it examines the current status of the flow data, their historical developments, and the various problems encountered with their use.

Size of the flows

The gross flow statistics for 1984 indicate that the movements of persons into and out of the labor force are many times larger than the measured net changes for any month. To illustrate, take the changes which these statistics show to have occurred between August and September. The published "stock" data showed a labor force decline of 1,233,000 representing principally the seasonal outflow of students from summer jobs and their return to school. It is in terms of this change (in data that have not been seasonally adjusted) that the gross flow data should be examined.[3]

The key gross flow data for any 2-month period can be condensed into a 3 × 3 table showing the number of persons employed, unemployed, or out of the labor force in the initial month in terms of their status the following month. For the August and September 1984 period, the 3 × 3 table would have looked as follows (numbers in thousands):

	Status in September		
Status in August	Employed	Unemployed	Not in labor force
Employed	100,212	1,787	4,702
Unemployed	2,080	4,092	1,748
Not in labor force	3,266	1,740	57,136

If no one had changed labor force status between these months, all the values in the table would have been entered in the three cells on the (shaded) diagonal line running from the upper left to the lower right. The values off of the diagonal line represent persons whose labor force status, as observed in the CPS, changed between the 2 months. We see, for example, that of the 106.7 million persons who were employed in August, 100.2 million were still employed the following month, 1.8 million had become unemployed, and 4.7 million had left the labor force. Of the 7.9 million who were unemployed in August, 4.1 million were still unemployed in September, while 2.1 million had gotten jobs and 1.7 million had left the labor force. In other words, nearly as many persons were recorded as having left the unemployed universe as remained. And, finally, of the 62.1 million persons who were outside the labor force in August, 57.1 million were still out the following month, while 1.7 million were reported as looking for work and 3.3 million became employed.

The total movements into and out of the labor force between the 2 months can be quickly estimated from the off-diagonal cells in the 3 × 3 table—specifically the column and row on persons not in the labor force. These cells show the following August–September movements:

Persons entering the labor force	5,006,000
Persons leaving the labor force	6,450,000
Net change based on gross flow data	− 1,444,000

In this particular case, the net change in the civilian labor force as derived from the gross flow statistics exceeds the net change in the stock data (− 1,233,000) by about 200,000. Such a difference, while bothersome, is probably tolerable given (1) the fact that the gross flow data are drawn from only a subset of the CPS sample and (2) the particularly large

magnitude of the movements which the gross flow statistics measured over this period. Note that they showed 5 million persons entering the labor force and nearly 6.5 million leaving it. Thus, the discrepancy between the two sets of data for this particular period amounts to no more than 3 percent of the outflows and may be regarded as of acceptable magnitude. Unfortunately, the discrepancies between the two sets of data for all other months of 1984 were considerably larger.

The average month-to-month gain in the civilian labor force during 1984 was about half a million smaller (or the decline half a million larger) as computed from the gross flow tables, than as shown by the published monthly data. (See table 1.) In fact, had the gross flow data been used to compute the *cumulative* change in the labor force over the December 1983–December 1984 period, they would have yielded a *decline* of 3.7 million—this over a period when the labor force had posted an *increase* of 2.2 million.

On the basis of these numbers, one would have to conclude that in the calculation of the gross flows, there is either a large underestimation of the entries into the labor force or a large overestimation of the exits, or a combination of the two phenomena.

Movements within the labor force

It should be noted that, in addition to measuring the flows into and out of the labor force, the gross flow data are also of much interest because of what they tell us about flows occurring strictly within the labor force, particularly between the employed and unemployed components. Focusing again on the flows between August and September 1984, we find the following:

Persons moving from:
Employment to unemployment 1,787,000
Unemployment to employment 2,080,000

Although these numbers do not exhaust all the possible movements into and out of employment and unemployment—as many of these originate and wind up outside the labor force—they serve nevertheless to highlight the fluidity of the employment situation in the United States. Note that these movements occurred over a period which saw little change in the unemployment situation for the Nation (with the unemployment rate, not seasonally adjusted, edging down .2 percentage point, from 7.3 percent in August to 7.1 percent in September).

A more complete picture of the labor force flows for 1984 is presented in table 2, which also contains data for men and women. Note, for example, the large numbers of persons, both men and women, flowing into the labor force in June, as schools closed, increasing both the employment and unemployment counts. Note also that while men are more likely to move to and from employment and unemployment without leaving the labor force, women are much more likely to enter and exit through the not-in-the-labor-force avenue. Perhaps even more importantly, the table

Table 1. Net changes in the civilian labor force during 1984

[In thousands]

Month	Published data	Gross flow data	Difference
January	–770	–1,298	528
February	343	–34	377
March	460	–95	555
April	324	–91	415
May	1,099	388	711
June	2,142	1,344	798
July	805	153	652
August	–1,122	–1,443	321
September	–1,233	–1,444	211
October	407	–33	440
November	–135	–667	532
December	–87	–500	413
Total	2,233	–3,720	5,953

shows that a very large proportion of the persons who are unemployed in any given month are no longer unemployed the following month. On average, more than one-third of the men and nearly one-half of the women who were unemployed in a given month during 1984 were shown by the gross flow data to have found jobs or to have left the labor force by the following month. This implies a very large turnover among the unemployed, even if we allow, as we must, for the fact that the data overstate the actual magnitudes of flows.

Why publication was suspended

Gross flow statistics were developed very early in the history of the CPS and were published monthly through the early 1950's. However, as already noted, researchers in labor force dynamics soon discovered serious problems of inconsistency between the changes in the published labor force levels and the changes obtained by balancing out the inflows and outflows in the monthly gross flow tables. In particular, it became evident that, for reasons which are discussed later, the flow data tended to overstate the amount of monthly flows out of the labor force.

But there were yet other reasons which led to the suspension of the publication of gross flow statistics in 1953. Above all, the sampling plan used in the Current Population Survey was radically altered that year. Until then, the households selected for the sample were interviewed for only 6 consecutive months. In the sampling pattern adopted in 1953 and still in effect, a household is interviewed for 4 months, leaves the sample for 8 months, and returns for another 4 months, with one-fourth of the sample being replaced each month. (This means that only three-fourths of the households in the sample in any given month have also been in the sample the previous month, and the computation of the gross flow data must be limited to these matched cases.) Other changes introduced in 1953 involved the data processing procedures, the estimation procedure, and the geographic design of the sample. With all of these changes taking place, publication of the gross flow estimates was temporarily suspended. But because the basic problems of

inconsistency with the official stock data seemed to persist, publication of these estimates was not resumed even after all these changes were fully implemented.

Over the ensuing years, two presidential committees examined this issue. In 1962, the President's Committee to Appraise Employment and Unemployment Statistics (known as the Gordon Committee) urged that the problems be thoroughly researched so that publication of the gross flow data could be resumed.[4] Although some research was subsequently done, the inconsistency problems proved intractable and regular publication was not resumed.[5] In 1979, the National Commission on Employment and Unemployment Statistics re-examined the gross flow statistics and—after reviewing a paper which referred to them as "The Neglected Data Base"—recommended once more that the Bureau of the Census and the Bureau of Labor Statistics refine the estimation of these data and resume their publication.[6] Pursuant to this recommendation, publication was resumed on an annual basis, but without any adjustments to the data. Thus, the basic problems of inconsistency with the net changes

and possible overestimation of the flows remained unsolved.

The problems

Several factors, including response variability in the CPS, the effects of conditioning on responses, noninterview and mover effects, and matching and clerical errors, have been identified as possible reasons for the inconsistency between the gross flows and the net changes and for the possible overstatement of flows. These factors were studied in detail by the participants in the July 1984 conference and are reviewed briefly below.

Exclusion of noninterviews and movers. In the CPS, the changes in labor force status from one month to the next can be observed only in households that have been in the sample for at least 2 months. In any given month, one-fourth of the households are either totally new to the CPS sample or are reentering it after an 8-month hiatus. Therefore, labor force movements can, at best, be recorded for only three-fourths of the persons in the sample.

Table 2. Labor force status in reference month by status in previous month, 1984

Reference month	Status of persons who were employed in previous month				Status of persons who were unemployed in previous month				Status of persons who were not in labor force in previous month			
	Total	Still employed	Unemployed	Not in labor force	Total	Employed	Still unemployed	Not in labor force	Total	Employed	Unemployed	Still not in labor force
Total (thousands)												
January	103,679	97,876	2,268	3,535	8,618	1,610	5,183	1,825	63,236	2,314	1,748	59,174
February	101,447	96,920	1,822	2,705	9,486	2,217	5,478	1,791	64,746	2,598	1,864	60,285
March	102,278	98,217	1,535	2,526	9,061	2,009	5,318	1,733	64,485	2,432	1,732	60,322
April	103,003	99,044	1,366	2,593	8,943	2,178	5,054	1,711	64,023	2,372	1,841	59,810
May	104,166	99,926	1,462	2,778	8,228	2,036	4,601	1,592	63,728	2,985	1,773	58,969
June	105,421	99,841	1,857	3,722	7,787	2,250	4,013	1,525	63,076	4,340	2,251	56,485
July	107,237	102,010	1,855	3,372	8,292	2,219	4,407	1,665	60,910	3,230	1,960	55,720
August	107,428	101,163	2,029	4,236	8,423	2,310	4,241	1,872	60,732	2,941	1,724	56,068
September	106.701	100,212	1,787	4,702	7,920	2,080	4,092	1,748	62,142	3,266	1,740	57,136
October	105,835	101,071	1,726	3,037	7,785	2,003	4,093	1,690	63,336	2,844	1,850	58,642
November	106.626	101.525	1,828	3,273	7,803	1,877	4,110	1,817	62,706	2,750	1,673	58,284
December	106,484	102,208	1,549	2,727	7,686	1,435	4,604	1,647	63,136	2,336	1,538	59,262
Men												
January	58,077	55,285	1,443	1,349	5,031	1,030	3,266	736	20,094	917	747	18,430
February	56,995	54,707	1,244	1,044	5,639	1,389	3,474	777	20,637	974	729	18,934
March	57,250	55,302	993	955	5,333	1,269	3,363	702	20,754	1,060	731	18,963
April	57,722	55,837	881	1,005	5,178	1,354	3,079	745	20,504	904	775	18,825
May	58,471	56,566	855	1,049	4,671	1,290	2,732	649	20,337	1,201	721	18,415
June	59,457	57,153	1,127	1,177	4,249	1,356	2,305	589	19,849	2,071	1,007	16,771
July	61,069	58,724	1,143	1,202	4,463	1,258	2,536	668	18,096	1,179	763	16,154
August	61,247	58,335	1,149	1,763	4,472	1,335	2,340	797	17,975	1,057	608	16,310
September	60,994	57,717	1,106	2,171	3,913	1,077	2,179	658	18,873	1,050	626	17,197
October	59,873	57,527	1,057	1,290	4,125	1,116	2,276	732	19,884	1,009	717	18,158
November	59,998	57,480	1,244	1,274	3,917	999	2,210	708	20,056	1,079	718	18,259
December	59,691	57,518	1,081	1,093	4,111	817	2,662	631	20,255	926	694	18,635
Women												
January	45,602	42,591	825	2,186	3,586	580	1,917	1,089	43,142	1,397	1,001	40,744
February	44,452	42,213	577	1,661	3,847	829	2,004	1,014	44,110	1,624	1,135	41,350
March	45,028	42,915	542	1,571	3,727	741	1,955	1,032	43,731	1,372	1,000	41,359
April	45,281	43,207	485	1,589	3,765	823	1,975	966	43,519	1,468	1,066	40,984
May	45,696	43,360	607	1,729	3,557	746	1,869	943	43,390	1,784	1,052	40,554
June	45,964	42,688	730	2,545	3,538	894	1,708	937	43,227	2,269	1,244	39,714
July	46,168	43,287	712	2,169	3,829	961	1,871	997	42,814	2,051	1,198	39,565
August	46,181	42,828	880	2,473	3,951	975	1,901	1,075	42,757	1,883	1,116	39,757
September	45,706	42,494	682	2,531	4,006	1,003	1,913	1,090	43,269	2,216	1,114	39,939
October	45,961	43,545	670	1,747	3,661	887	1,817	957	43,452	1,835	1,134	40,484
November	46,627	44,044	584	1,999	3,886	878	1,900	1,109	42,651	1,670	955	40,026
December	46,793	44,690	468	1,635	3,575	617	1,942	1,016	42,881	1,410	844	40,627

Table 2. Continued—Labor force status in reference month by status in previous month, 1984

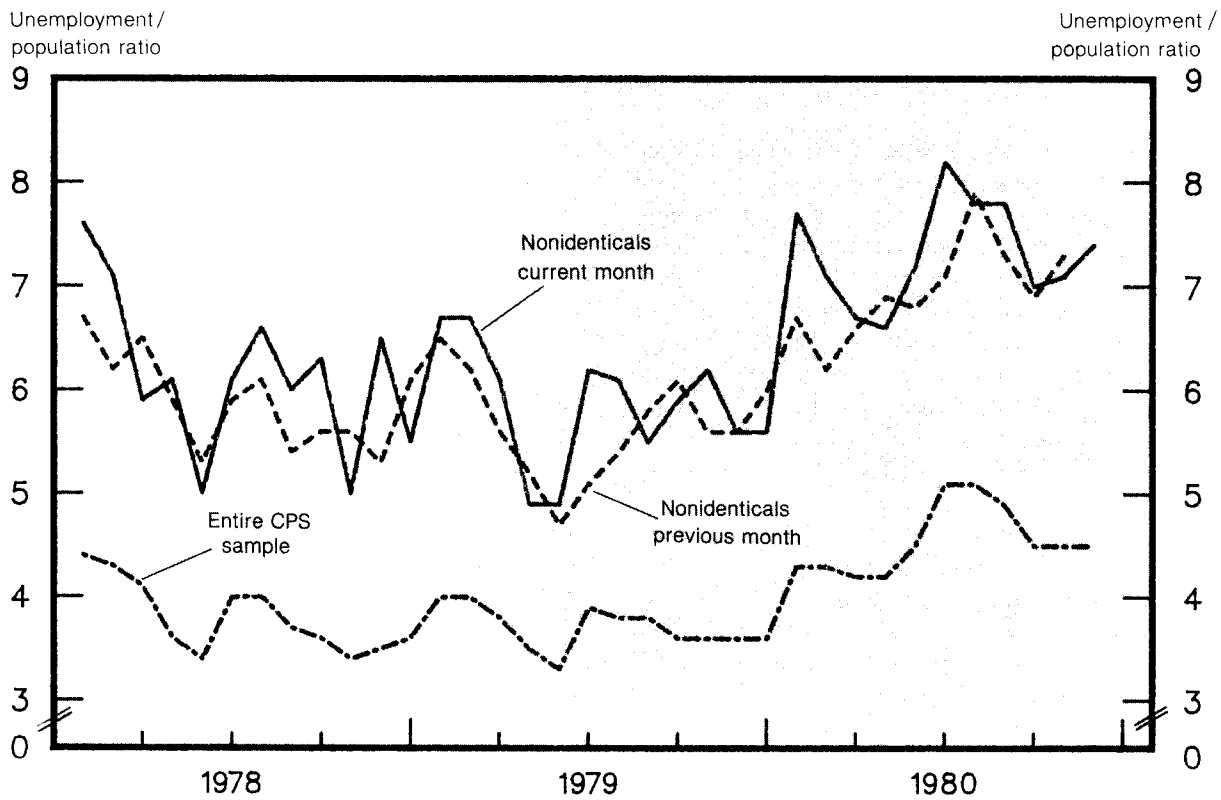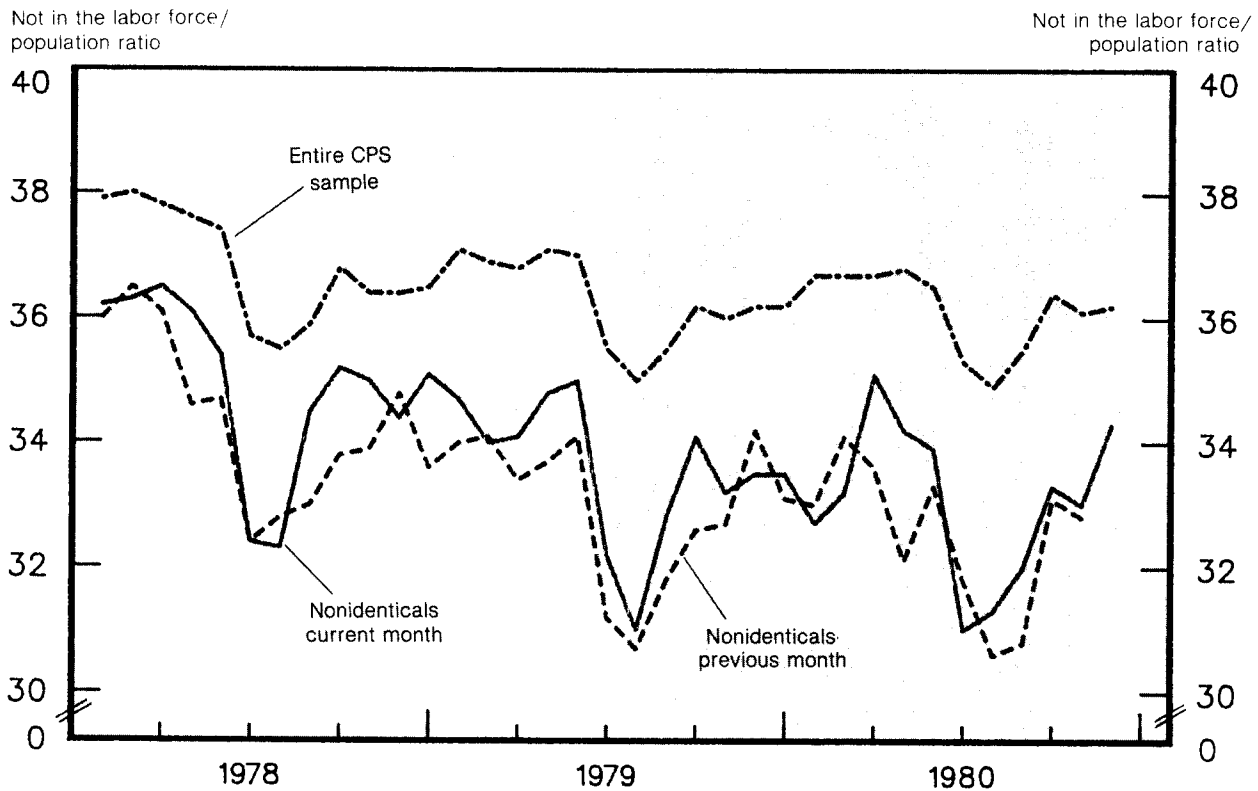| Reference month	Status of persons who were employed in previous month				Status of persons who were unemployed in previous month				Status of persons who were not in labor force in previous month			
	Total	Still employed	Unemployed	Not in labor force	Total	Employed	Still unemployed	Not in labor force	Total	Employed	Unemployed	Still not in labor force
Total (percent)												
January	100.0	94.4	2.2	3.4	100.0	18.7	60.1	21.2	100.0	3.7	2.8	93.6
February	100.0	95.5	1.8	2.7	100.0	23.4	57.7	18.9	100.0	4.0	2.9	93.1
March	100.0	96.0	1.5	2.5	100.0	22.2	58.7	19.1	100.0	3.8	2.7	93.5
April	100.0	96.2	1.3	2.5	100.0	24.4	56.5	19.1	100.0	3.7	2.9	93.4
May	100.0	95.9	1.4	2.7	100.0	24.7	55.9	19.3	100.0	4.7	2.8	92.5
June	100.0	94.7	1.8	3.5	100.0	28.9	51.5	19.6	100.0	6.9	3.6	89.6
July	100.0	95.1	1.7	3.1	100.0	26.8	53.1	20.1	100.0	5.3	3.2	91.5
August	100.0	94.2	1.9	3.9	100.0	27.4	50.4	22.2	100.0	4.8	2.8	92.3
September	100.0	93.9	1.7	4.4	100.0	26.3	51.7	22.1	100.0	5.3	2.8	91.9
October	100.0	95.5	1.6	2.9	100.0	25.7	52.6	21.7	100.0	4.5	2.9	92.6
November	100.0	95.2	1.7	3.1	100.0	24.1	52.7	23.3	100.0	4.4	2.7	92.9
December	100.0	96.0	1.5	2.6	100.0	18.7	59.9	21.4	100.0	3.7	2.4	93.9
Men												
January	100.0	95.2	2.5	2.3	100.0	20.5	64.9	14.6	100.0	4.6	3.7	91.7
February	100.0	96.0	2.2	1.8	100.0	24.6	61.6	13.8	100.0	4.7	3.5	91.7
March	100.0	96.6	1.7	1.7	100.0	23.8	63.1	13.2	100.0	5.1	3.5	91.4
April	100.0	96.7	1.5	1.7	100.0	26.1	59.5	14.4	100.0	4.4	3.8	91.8
May	100.0	96.7	1.5	1.8	100.0	27.6	58.5	13.9	100.0	5.9	3.5	90.5
June	100.0	96.1	1.9	2.0	100.0	31.9	54.2	13.9	100.0	10.4	5.1	84.5
July	100.0	96.2	1.9	2.0	100.0	28.2	56.8	15.0	100.0	6.5	4.2	89.3
August	100.0	95.2	1.9	2.9	100.0	29.9	52.3	17.8	100.0	5.9	3.4	90.7
September	100.0	94.6	1.8	3.6	100.0	27.5	55.7	16.8	100.0	5.6	3.3	91.1
October	100.0	96.1	1.8	2.2	100.0	27.1	55.2	17.7	100.0	5.1	3.6	91.3
November	100.0	95.8	2.1	2.1	100.0	25.5	56.4	18.1	100.0	5.4	3.6	91.0
December	100.0	96.4	1.8	1.8	100.0	19.9	64.8	15.3	100.0	4.6	3.4	92.0
Women												
January	100.0	93.4	1.8	4.8	100.0	16.2	53.5	30.4	100.0	3.2	2.3	94.4
February	100.0	95.0	1.3	3.7	100.0	21.5	52.1	26.4	100.0	3.7	2.6	93.7
March	100.0	95.3	1.2	3.5	100.0	19.9	52.5	27.7	100.0	3.1	2.3	94.6
April	100.0	95.4	1.1	3.5	100.0	21.9	52.5	25.7	100.0	3.4	2.4	94.2
May	100.0	94.9	1.3	3.8	100.0	21.0	52.5	26.5	100.0	4.1	2.4	93.5
June	100.0	92.9	1.6	5.5	100.0	25.3	48.3	26.5	100.0	5.2	2.9	91.9
July	100.0	93.8	1.5	4.7	100.0	25.1	48.9	26.0	100.0	4.8	2.8	92.4
August	100.0	92.7	1.9	5.4	100.0	24.7	48.1	27.2	100.0	4.3	2.6	92.0
September	100.0	93.0	1.5	5.5	100.0	25.0	47.8	27.2	100.0	5.1	2.6	92.3
October	100.0	94.7	1.5	3.8	100.0	24.2	49.6	26.1	100.0	4.2	2.6	93.2
November	100.0	94.5	1.3	4.3	100.0	22.6	48.9	28.5	100.0	3.9	2.2	93.8
December	100.0	95.5	1.0	3.5	100.0	17.3	54.3	28.4	100.0	3.3	2.0	94.7

But even within the three-fourths of the sample that are common for any two months, there are many persons for whom the changes in labor force status cannot be recorded. These are primarily persons who move into and out of sample households during the interview cycle. Because the CPS uses a sample of residential addresses rather than a list of persons, the families or persons who move away from sample addresses drop out of the survey. Meanwhile, the families or persons who might take their places in sample households have to be interviewed for 2 consecutive months before they can contribute any data to the gross flow calculations.

While only 2 percent or fewer of the American people move each month, the exclusion of movers from the gross flow calculations not only decreases the sample but also introduces some bias. As Harvey Hilaski showed in 1968, movers are generally younger and have higher unemployment rates.[7] Because such young workers are also generally very mobile in terms of labor force status, the fact that they are not followed in the Current Population Survey may, by itself, result in a slight underestimate of the total labor force flows. And, in addition to the persons that move permanently, there are those who are temporarily absent from their households during one or more of the interview weeks, or who refuse to cooperate with the interviewer even if they are home. Little is known about the characteristics of these persons.

Chart 1 compares the labor force status of "nonidenticals" (that is, persons who cannot be matched from one month to the next for reasons other than the fact that their address is new to the sample) with the official labor force data for the 1978–80 period. (Note that the rates in the chart are computed using the population—not the labor force— as the denominator.) As shown, nonidenticals have unemployment/population ratios considerably higher than those for the total CPS sample and not-in-labor force ratios that are considerably lower than the published ones. The exclusion of nonidenticals from the gross flow calculations is thus a contributing cause for the discrepancies with the changes in the published labor force totals.

Chart 1. Comparisons of key ratios for persons who cannot be matched from one month to the next (nonidenticals) with same ratios for entire Current Population Survey (CPS) sample

Not in the labor force/
population ratio

Not in the labor force/
population ratio

Entire CPS
sample

Nonidenticals
current month

Nonidenticals
previous month

40

38

36

34

32

30

0

40

38

36

34

32

30

0

1978   1979   1980

Unemployment/
population ratio

Unemployment/
population ratio

Nonidenticals
current month

Entire CPS
sample

Nonidenticals
previous month

9

8

7

6

5

4

3

0

9

8

7

6

5

4

3

0

1978   1979   1980

Response variability. Deliberate or inadvertent errors in the responses to CPS questions also plague the gross change data—and may result in large overestimates of the actual flows. Any responsible person over age 14 can answer Current Population Survey questions for the entire household. Thus, inconsistencies may arise because of faulty knowledge on the part of the respondent. Also, respondents may differ from one month to the next, leading to possibly different interpretations of the labor force questions. Changes in the labor force status of household members may thus be reported even when no change has actually taken place. Indeed, even if the same respondent is interviewed for 2 consecutive months, he or she may provide answers which yield a change in labor force classification for a person whose status has not really changed at all.

Rotation group bias. For reasons that have never been fully understood, the findings from the CPS tend to differ in a systematic way among the various month-in-sample groups, particularly with regard to the reported incidence of unemployment. As documented by Barbara A. Bailar in 1975, the households being interviewed for the first time tend to report considerably more unemployment than those being interviewed for a second or third time.[8] A study of 3 years of data covering the 1973–75 period showed that, on average, the first-month households reported a 10-percent higher incidence of unemployment than was being reported by the entire sample.[9] And the unemployment reported by households in the fifth month-in-sample group (those returning to the sample after an 8-month absence) was also significantly higher than that reported by households in the sixth through eighth months-in-sample. In other words, many persons reported as unemployed in the first visit to their household by a CPS interviewer (or the first in many months in the case of the fifth month-in-sample group) are subsequently reported as no longer unemployed. And there is also a slight tendency in the same direction in the reporting of employment. It is principally this decrease in "reported" labor force activity after the first (and fifth) interview that leads to systematic overestimation of the outflows from unemployment—and from the labor force in general—in the gross flow tables.

There are many possible reasons for this pattern in the reporting of labor force activity, including the fact that the initial interview is generally conducted in person, whereas subsequent ones are generally conducted by telephone and may involve different respondents and changing probabilities of nonresponse.[10] Among other possible reasons, it has been speculated that respondents are more ill at ease in the initial interview than in subsequent ones, and thus also more likely to exaggerate the reporting of "socially acceptable" activities—such as working or looking for work. It has also been proposed that the rotation group bias in the reporting of unemployment (and, to a lesser extent, employment) may reflect a phenomenon known as "telescoping". This relates to the recall of an event that may have occurred 2 or 3 months previously, but which is reported as having occurred much more recently. For example, an event that is rare or traumatic, such as a period of unemployment, may be reported in the first interview even if it had occurred before the actual reference period for the survey. Yet another possible reason for the reporting pattern is the conditioning of respondents (and perhaps even of interviewers) after the initial interview. They may quickly learn the shortest path through the questionnaire and refrain from reporting (or recording) any labor force activity, particularly of the more marginal type, in order to put an end to the interview.[11]

Whatever the reason for the phenomenon and their relative impact on the data, there is a definite pattern in the reporting of unemployment among the various month-in-sample groups in the CPS. Carma Hogue in 1984 examined the gross change tables for the 1976–81 period, and compared the entries in the tables for the second and eighth month-in-sample groups combined to those for the third, fourth, sixth, and seventh month-in-sample groups combined. (Groups that are in the sample for the third, fourth, sixth, or seventh time are believed to be more stable.) The comparison of the distributions for these groups revealed, with 95 percent confidence, that month-in-sample groups 2 and 8 were significantly different from the others in 40 of the 72 months studied. In the months of May and August, the two groups were always significantly different, confirming the view that, for some reason, the gross change calculations are definitely affected by how long the CPS respondents have been in the sample.

Problems in matching data. In order to produce the paired responses needed for the gross change tables, the records of persons in the CPS are matched from one month to the next on the basis of six household characteristics and four characteristics that are unique to each person. To evaluate the quality of the matching procedure, a special computer match of records for January 1979 with those of February 1979 was done at the Bureau of the Census. In this test, approximately 8 percent of the cases failed to match. A clerical check of all nonmatched cases revealed that inaccurate coding accounted for most of the matching failures.

While a survey of 1982 data showed that the coding had been improved, it must be recognized that, in a survey as large as the CPS, coding errors can never be eliminated entirely. It is thus inevitable that some records will fail the month-to-month match, even when the labor force status is correctly recorded. This problem, coupled with the errors arising from incorrect interpretation of the questions, the miscoding of answers, conditioning, and so forth, have a much greater effect on the gross change data than they have on monthly levels and net changes. While such errors tend to offset each other in the monthly stock measurement, their effect is cumulative in the gross change data, and, on average, results in an overestimate of the monthly flows.

Proposed solutions

Suggestions for solutions to the problems affecting the estimation of gross flow data could be categorized either as alternative forms of estimation or as changes in CPS procedures. At the 1984 conference, there were some suggestions for changes in the way the CPS is conducted, but most of the participants proposed different methods for estimating the gross change data without altering the survey. These alternative estimation procedures—which generally tend to reduce the volume of the flows—are summarized below. A complete version of the papers appears in a volume of the proceedings of the conference. The volume is available from the Bureau of Labor Statistics or the Bureau of the Census.

The simplest adjustment technique presented is iterative proportional fitting (or raking). In this procedure, each of the nine cell entries in the 3×3 gross change tables is adjusted so that the net changes that can be deduced from them are consistent with the changes in the published CPS data. This procedure was applied by Carma Hogue to the flow data for the 1976–81 period. While the adjustment results in flows that are consistent with the changes in the published monthly data, it does not necessarily improve the accuracy of the specific flows.

Jean Vanski reported on an estimation technique she and Ralph Smith used in 1978. Separate equations for the change in employment from one month to the next, for the change in unemployment, and for the change in nonparticipation in the labor force were generated from the full CPS and from the gross change tables. As an example of one of these three equations, the change in the level of unemployment for 2 consecutive months (which is estimated from the full CPS) should be equal to the total number of persons entering unemployment minus the number of persons leaving unemployment. These inflows and outflows are estimated from the gross change tables and are then adjusted through special correction parameters. Smith and Vanski introduced a technique which would account for month-to-month changes in the variable of interest and would correct each of the four flow variables in the equation. In their estimation method, the three identity equations mentioned above are combined in a constrained multivariate regression. One correction factor per flow is estimated. The application of this procedure to data for the 1967–77 period often resulted in a reduction in the flows for adults. However, the flows for teenagers were often increased.

Wayne Fuller and Tin Chiu Chua presented a model which compensates for response errors in the CPS. The model utilizes data from the unreconciled portion of the Reinterview Survey, which is conducted as a quality control in the CPS.[12] Data from interview-reinterview tables, were used to derive a matrix of probabilities that a person will respond one way in the original survey and another way in the reinterview. These response probabilities—which were found to be rather constant over time—were then used to adjust the gross change data for month-to-month changes resulting from re-

sponse errors. Fuller and Chua found a particularly high probability of response error in the distinction between being unemployed or not in the labor force. They suggest that one first rake the gross change tables in order to make the margins consistent with the published data. However, the adjustments for response errors are much larger than the raking adjustment in the Fuller-Chua procedure.

The Fuller-Chua methodology results in much smaller monthly flows out of unemployment than those shown by the unadjusted data from the CPS. (See chart 2.) While their procedure does not greatly reduce the monthly flows from unemployment to employment—which still approach one-fifth of the jobless universe—it yields a radically smaller monthly flow of persons from unemployment to not in the labor force. Conversely, the Fuller-Chua procedure yields

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Papers presented at July 1984 Conference on Gross Flows in the Labor Force

Carma R. Hogue, "History of the Problems Encountered in Estimating Gross Flows."

Jean E. Vanski, "Use of Gross Change Data in Assessing Demographic Labor Market Dynamics."

Wayne A. Fuller and Tin Chiu Chua, "Gross Change Estimation in the Presence of Response Error."

James M. Poterba and Lawrence H. Summers, "Adjusting the Gross Changes Data: Implications for Labor Market Dynamics."

John M. Abowd and Arnold Zellner, "Application of Adjustment Techniques to U.S. Gross Flow Data."

Elizabeth A. Stasny and Steven E. Fienberg, "Some Stochastic Models for Estimating Gross Flows in the Presence of Nonrandom Nonresponse."

Gary Solon, "Effects of Rotation Group Bias on Estimation of Unemployment."

Robert J. McIntire, "Toward More Stable Flows: A Discussion and Initial Investigation of Some Alternatives or Supplements to Monthly Gross Flow Data."
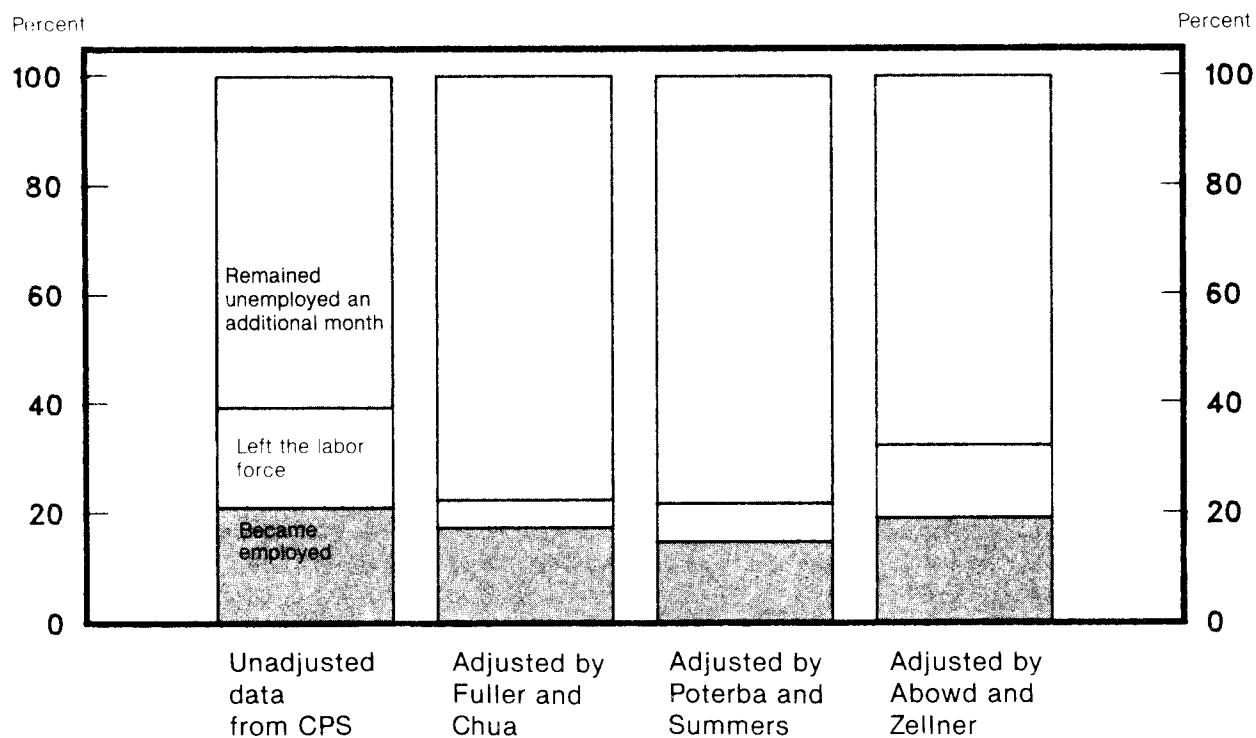
John M. Evans, "Gross Flow Statistics Outside North America: Construction and Use."

Richard Veevers, "Estimating Gross Flows from the Canadian Labour Force Survey."

Carma R. Hogue, "Future Directions in the Estimation of Gross Flows."

Chart 2. Average monthly flows out of unemployment during 1982

Percent

Remained unemployed an additional month			
Left the labor force			
Became employed			

Unadjusted data from CPS | Adjusted by Fuller and Chua | Adjusted by Poterba and Summers | Adjusted by Abowd and Zellner

a much greater estimate of the average proportion of the unemployed who remained jobless an additional month (77.7 percent) than is shown by the unadjusted data from the CPS (60.6 percent).

Another procedure for correcting the classification errors affecting the gross flows measurements was presented by James Poterba and Lawrence Summers. They estimated the incidence of response errors utilizing data from the CPS Reinterview Survey and recalculated the flow after adjusting for spurious transitions. Poterba and Summers presented separate estimates of response error rates based on the reconciled portion of the CPS Reinterview Survey and for the combined reconciled and unreconciled portions. They found that the reconciled portion of the reinterview program yields overly conservative estimates of the response error. They finally show that when the gross flow data are adjusted on the basis of either of these two rates of response errors, there is a dramatic decrease in the proportion of persons changing labor force status from one month to the next. Their procedure reveals substantial differences across demographic groups in the rates of response errors and in the subsequent adjustment to the flow data. One result is a reduction in the probability of exit from the labor force of about 90 percent for adult men and one-third for teenagers. As with the Fuller-Chua procedure, the Poterba and Summers adjustments would result in much smaller monthly flows out of unemployment. (See chart 2.)

John Abowd and Arnold Zellner presented a procedure which compensates for missing data without assuming that the data are missing at random and which also adjusts for classification error. They first use a "margin adjustment" procedure which is a multiplicative method of allocating missing data to the cells of the gross change table. Their model for adjusting for classification error is based on applying error classification probabilities estimated from the reconciled portion of the CPS Reinterview Survey to the margin adjusted gross flows. This adjustment increases the entries in the diagonal cells of the 3×3 flow table and decreases the entries in the off-diagonal cells, thus reducing the flows. The average adjustment due to missing data varied between -12 percent and 15 percent. The average adjustment for classification error reduced estimates of flows by nearly 50 percent in some cases.

The flows out of unemployment as adjusted on the basis of the proposed Abowd–Zellner procedure are shown in chart 2. While the Abowd–Zellner procedure also reduces the flows out of unemployment relative to those based on the unadjusted CPS data, the reduction is not nearly as large— particularly with regard to the proportion of the unemployed leaving the labor force—as that resulting from the Fuller– Chua or Poterba–Summers adjustments.

Elizabeth Stasny and Stephen Fienberg examined some stochastic models for adjusting the gross flow data for nonresponse in the CPS. In these models, nonresponse is as-

sumed to be dependent on either the person's month in sample or employment classification. Three models based on different combinations of these two assumptions were presented along with examples of the fitting of these models to 1982 data. Stasny and Fienberg gave the methods for obtaining maximum likelihood estimates for the parameters. Some continuous-time Markov chain models were also introduced, given that changes in labor force status are deemed to occur at any time during the month, rather than the fixed time points of the interview.

Gary Solon discussed the effects of rotation group bias on estimating unemployment. He examined a model of multiplicative biases—which are assumed to vary proportionately in line with the changes in the unemployment level—and estimated their effect on ratio and composite estimators of month-to-month changes in unemployment. The empirical evidence presented in his paper suggests that there is indeed a multiplicative aspect to rotation group bias. Solon also experimented with a mixed multiplicative and additive model and found that, both in this model and in the purely multiplicative model, the ratio and the composite estimators give biased estimates of level and of change.

Robert McIntire discussed some alternative approaches to using the existing gross flow data. He indicated that the measurements of month-to-month flows, in addition to being affected by sampling and response errors, are also a reflection of transitory or insignificant movements, the inclusion of which limits the value of the flow data for analyzing labor force dynamics. He suggested developing flow data spanning longer time periods, focusing on changes in "usual" or "primary" labor force status. He also suggested using approaches that would work at the microdata (or individual respondent) level. To focus on one's status over a longer period, McIntire used data from the March supplement of the CPS, which relate to the usual status over an entire year. He also examined the possibility of comparing one's status in a given month with one's "usual" status over the previous 3 months, as well as a variant using 2-month spans.

John Evans of the Organization for Economic Cooperation and Development discussed the gross flow data available in other countries. He noted that very few countries outside the United States and Canada have published flow data from household surveys. Only Australia publishes such data on a regular basis. The Nordic countries are beginning a joint research project in this area. Italy has also carried out experiments in constructing flow statistics from matched samples. Evans added that most European countries have unemployment registration systems which yield fairly reliable gross flow data, but which lack demographic detail.

Richard Veevers of Statistics Canada reported on research designed to increase the quality of the gross flow data from the Canadian Labour Force Survey. He noted that Statistics Canada produces a 4 × 4 table in which the data for a given month on the employed, unemployed, persons not in the labor force, and nonmatched persons are cross-classified

with similar characteristics for the subsequent month. He explained that iterative proportional scaling is used to rake the data in the flow tables so as to make them consistent with the changes in the stock data, but added that the data are still subject to errors arising from sampling variability, misclassification, and rotation group bias.

Recommendations for procedural changes

In addition to proposing new ways for computing the flows, several participants at the conference suggested various changes in the way the CPS is conducted. For example, it was proposed that, in the reinterview program, a sample of persons be reinterviewed for 2 consecutive months. It was also suggested that fewer of these interview results be reconciled with the original interviews and that questions emphasizing change in status from one month to the next be used to check the effect of changing coders, respondents, and so forth.

Other suggestions were aimed at gathering information on persons for whom data are missing for some of the survey months. These included (1) calling movers after receiving a change of address card from them, (2) asking retrospective questions of persons moving into sample households after the first of the four interviews in each of the two 4-month stints of the CPS interview cycle, and (3) supplying CPS interviewers with the names and ages of all persons who were interviewed at the household the previous month with instructions to obtain labor force data for the same persons, thus minimizing the possibility of nonmatches or erroneous matching in the gross flow calculations.

Other participants suggested assigning unique identification numbers to each person in the sample in order to facilitate the matching procedure. This would reduce the number of nonmatches and incorrect matches. The use of computer assisted telephone interviewing, which is structured so as to maximize consistency in the interviewing process, was also mentioned as a possible way to both ease the burden of recordkeeping and provide better quality data.

FURTHER RESEARCH IN THE MEASUREMENT of labor force flows is planned by the Bureau of the Census and the Bureau of Labor Statistics. This will include testing the various adjustment methods proposed by the conference participants. Some research on flows will also be conducted with data from the Survey of Income and Program Participation, in which changes in labor force status are tracked over a 2½-year period. Out of this research and the further work being carried on by some of the participants in the 1984 conference, a way should be found over the next few years to finally exploit the great potential of the gross flow statistics—"the neglected data base." □

------FOOTNOTES------

[1] See Harvey J. Hilaski, "The Status of Research on Gross Changes in the Labor Force," *Employment and Earnings*, October 1968.

[2] Publication of gross flow data was resumed in 1982 by means of a report entitled "Gross Flow Data from the Current Population Survey, 1970–1980," available from the National Technical Information Service.

[3] Because the data on gross flows have never been seasonally adjusted, they cannot be compared with the changes in the seasonally adjusted labor force levels, which increased by about 200,000 between August and September 1984.

[4] President's Committee to Appraise Employment and Unemployment Statistics, Measuring Employment and Unemployment (Government Printing Office, 1962.)

[5] See Hilaski, "The Status of Research." See also Robert B. Pearl, "Gross Change in the Labor Force: A Problem in Statistical Measurement," Employment and Earnings, April 1963; Thomas F. Bradshaw, Employment in Perspective: A Cyclical Analysis of Gross Flows in the Labor Force, Report 508 (Bureau of Labor Statistics, 1977); and Ralph E. Smith and Jean I. Vanski, "The Volatility of the Teenage Labor Market: Labor Force Entry, Exit, and Unemployment Flows," in Conference Report on Youth Unemployment: Its Measurement and Meaning (Government Printing Office, 1978).

[6] National Commission on Employment and Unemployment Statistics, Counting the Labor Force (Government Printing Office, 1979.)

[7] Hilaski, "The Status of Research."

[8] Barbara A. Bailar, "The Effect of Rotation Group Bias on Estimates from Panel Surveys," Journal of the American Statistical Association, March 1975, pp. 23–30.

[9] See discussion of rotation group bias in The Current Population Survey: Design and Methodology, Technical Paper 40 (Department of Commerce, Bureau of the Census, January 1978), pp. 83–85.

[10] W.H. Williams and C.L. Mallows, "Systematic Biases in Panel Surveys due to Differential Nonresponse," Journal of the American Statistical Association, September 1970, pp. 1338–49.

[11] See Herbert S. Parnes, "Longitudinal Surveys: Prospects and Problems," Monthly Labor Review, February 1972, pp. 11–15. Parnes examined a different type of conditioning, the Heisenberg Principle, according to which a person may actually be influenced to modify his or her labor force behavior because of the very questions asked in the survey. For example, a nonworker who is merely contemplating the possibility of looking for a job may decide to actually seek work after being questioned about any employment or jobseeking activity.

[12] Each month, about 1 in 18 of the households in the CPS sample are reinterviewed as part of a quality control program. The reinterviews are conducted by senior interviewers or supervisors. When differences arise between the information provided in the original interview and that from the reinterview, a reconciliation is performed. However, in 20 percent of the cases, the reinterviewer is not provided any information from the original interview and no reconciliation is performed. This yields a more unbiased view of the differences in the information gathered in the two surveys than can be obtained when the reinterviewer has the information from the previous interview. In the latter case, there appears to be a tendency to minimize the differences, even before any reconciliation is attempted.

A note on communications

The Monthly Labor Review welcomes communications that supplement, challenge, or expand on research published in its pages. To be considered for publication, communications should be factual and analytical, not polemical in tone. Communications should be addressed to the Editor-in-Chief, Monthly Labor Review, Bureau of Labor Statistics, U.S. Department of Labor, Washington, D.C. 20212.