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Food Stamp Certification Periods and Payment Accuracy

State Experience During 1997-2001

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Abstract

Quality control (QC) reviews of Food Stamp Program (FSP) cases show that error rates across States range from less than 5 percent to more than 25 percent when both overpayment and underpayment error are combined. This study uses QC data for 1997-2001 and a Markov probability framework to characterize year-to-year national and State error rates into variations due to errors occurring with first-month cases (those approved at initial certification); ongoing cases (those subject to the interim action process); and expiring cases (those subject to the recertification process). This information can be used in planning corrective actions by focusing attention on phases of the administrative process that are more responsible for errors. This study also explores the effect on payment accuracy and FSP participation of more frequent recertification of food stamp cases. A motivating concern is that the use of short certification periods (3 months or less) as a strategy to reduce case error may unintentionally reduce program participation.

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Executive Summary

This study explores the effects on payment accuracy and household participation in the Food Stamp Program of more frequent recertification of food stamp cases. A motivating concern for this research is that the use of short certification periods (three months or less in duration) as a strategy to reduce error among cases with earnings may unintentionally reduce program participation among such households.

This research on food stamp error and participation has three major objectives:

- to examine recent year-to-year national trends in error rates as affected by three food stamp administrative processes—initial certification, interim action, and recertification;
- to examine state-by-state differences in error rates and to diagnose the performance of low-error and high-error states in terms of their effectiveness at conducting initial certification, interim action, and recertification; and
- to examine the extent to which more frequent recertification, as a measure intended to reduce payment error especially among cases with earnings, may inadvertently lower program participation.

This research uses a probability model to explain the underlying month-to-month dynamics of the food stamp case error rate (the average monthly percentage of active cases that are in error) and the aggregate food stamp participation rate (the average monthly percentage of U.S. households that receive food stamps).

There is considerable variation in case error rates among states, ranging from less than 5 percent to more than 25 percent (combining both overpayment and underpayment errors, and including both agency-caused and client-caused errors). An important application of the model is to help explain this variation, by establishing the extent to which a state's error rate is attributable to errors among: first-month cases (those approved at initial certification); ongoing cases (those subject to the interim action process); and expiring cases (those subject to the recertification process). This information is especially important for planning corrective actions, so that state and local program directors can focus attention on the phase of the administrative process that is most responsible for errors.

Analytic Framework

In analyzing food stamp error, this study focuses on the case error rate, defined as the percentage of active cases whose benefits have been incorrectly computed. Each U.S. household is considered as belonging each month to one of five groups, according to whether

the household is participating in the Food Stamp Program and (if so) whether the household's food stamp payment is correct and whether the household is in the final month of its current food stamp certification period. The five groups are as follows:

- households not participating in the Food Stamp Program (“nonparticipating”);
- correctly paid food stamp cases, not in their final certification month (“ongoing correct”);
- incorrectly paid food stamp cases, not in their final certification month (“ongoing error”);
- correctly paid food stamp cases, in their final certification month (“expiring correct”); and
- incorrectly paid food stamp cases, in their final certification month (“expiring error”).

From one month to the next, each household may remain in its group or experience a transition to another. One can express the pattern of month-to-month changes in a five-by-five transition matrix. The entries in this matrix are probabilities, indicating the proportion of households in each group that will remain in their group or shift to a different group in the following month.

At the national level, we have derived the transition matrix for each year 1998 through 2001 using data from food stamp quality control (QC) reviews conducted by all states on an annual sample of their active food stamp cases. The nationwide annual sample consists of more than 46,000 cases. For each state (and the District of Columbia), we have calculated the transition matrix from the state's pooled sample over the period 1998-2001. At both the national and state levels, the model was derived separately for households with and without earnings.

From the estimated parameters of the transition matrix, a series of error indicators has been computed nationally and by state, as follows:

- ***Total error rate***
= case error rate among all active cases, indicating the percentage of cases that are ineligible, eligible but overpaid (by \$25 or more monthly), or eligible but underpaid (by \$25 or more monthly)
- ***First-month error rate***
= case error rate among first-month (newly certified) active cases

- ***Next-month error rate: ongoing correct cases***
= among ongoing cases not in error this month, the expected percentage in error next month
- ***Next-month error rate: ongoing error cases***
= among ongoing cases in error this month, the expected percentage in error next month
- ***Next-month error rate: expiring correct cases***
= among expiring cases not in error this month, the expected percentage in error next month
- ***Next-month error rate: expiring error cases***
= among expiring cases in error this month, the expected percentage in error next month

The total error rate (also referred to as the combined case error rate, in reported QC statistics) is the most general indicator of the presence of error among active cases. This measure is computed nationally and by state, for each fiscal year; it is included in the annual error rate statistics published by the Food and Nutrition Service (FNS). The other indicators are not included in FNS' conventional error statistics and are components of the total error rate, as follows:

- The first-month error rate is a measure of payment accuracy at initial certification.
- The next-month error rates for ongoing cases indicate the effectiveness of interim actions at preventing errors (among ongoing correct cases) and at detecting and correcting errors (among ongoing error cases).
- The next-month error rates for expiring cases indicate the effectiveness of recertifications at preventing errors (among cases that are correct as they enter recertification) and at detecting and correcting errors (among cases that are in error as they enter recertification).

The total *case* error rate is very highly correlated with the total *dollar* error rate (or payment error rate, the summed dollar amount of overpayment and underpayment errors as a percentage of total payment dollars). In FY 2001, the pairwise correlation between the two measures was 0.923 for the fifty states and the District of Columbia. For this reason, there is little loss of generality in focusing here on the total case error rate, even though the total dollar error rate is the basis for determining fiscal liabilities and enhanced funding.

Findings: National Error Rate Trends

The year-by-year national estimates of the component error rates provide a basis for explaining the downward trend in the national food stamp case error rate during 1998-2001. On a consistently measured basis, applying each year the same \$25 error threshold for eligible cases, the total case error rate declined nationally from 16.7 percent in 1998 to 12.8 percent in 2001.

The analysis conducted here indicates the factors contributing to the reduction in the national case error rate, separately for cases with earnings and for cases without earnings. For both caseload segments, one factor was a drop in the error rate at initial certification—i.e., the first-month error rate. This trend was accentuated by the fact that first-month cases came to comprise an increasing share of the caseload. Far more significant, however, was the improvement in the rate at which errors were prevented or corrected between formal case actions, through the interim action process. Also noteworthy was the drop in the next-month error rate for expiring error cases, as recertification procedures also appeared to improve in correcting errors.

Findings: State-by-State Error Patterns

Historically, food stamp error rates have shown substantial variations among states. Based on the state-by-state estimates of the model, some states achieve low total case error rates through strong performance in all three phases of the administrative process: initial certification, interim action, and recertification. Three states are in the lowest quartile for their total case error rate and are below the median in all of the component error parameters: Arizona, Kentucky, and Wyoming. Other states have low overall rates and show strong performance on some but not all phases of certification, indicating the potential for further improvement. Minnesota and South Carolina, for instance, have comparatively low total error rates despite evidence that their recertification procedures are not as effective as most other states in preventing and correcting errors among expiring cases. In contrast, Oklahoma and Oregon do reasonably well in containing errors at interim action and recertification, but each has a very high error rate at initial certification.

Findings: Effects of More Frequent Recertification

One can use the estimated model to test the long-term effects of alternative scenarios regarding the frequency of recertification. We define the “recertification rate” as the percentage of current-month active cases whose certification is about to expire and who are thus about to undergo recertification. The test conducted here examined an increase of 5 percentage points in the recertification rate for cases with earnings. Using 2000 as the base year, the recertification rate would be increased from 15.5 to 20.5 percent for earnings cases.

This corresponds approximately to a shortening of the average certification period from 6.5 months to 4.9 months.

Such a shift could either decrease or increase the case error rate, depending on whether or not the proportional reduction in error cases (the numerator of the case error rate) exceeds the proportional reduction in active cases (the denominator). Although in principle the effect on the “aggregate participation rate” (the percentage of households receiving food stamps) could also be either upward or downward, one expects a downward change. The reason is that a case termination is more likely when a case is subject to a recertification than in all other months (when the case is, by definition, subject to the interim action process). If recertifications occur more frequently and increase the rate of monthly case closure, this will expectedly lower the aggregate participation rate. Because of the possible sensitivity of estimates to the particular base year used for the calculations, separate estimates were computed using 2000 and 2001 as the base year.

For households with earnings, the alternative scenario involving more frequent recertification was found to result in a small long-term reduction in the number of error cases among households with earnings. The proportional reduction was estimated at 1.7 to 3.3 percent. The associated effect on the case error rate ranged from a small reduction of 0.20 percentage points to an increase of 0.76 percentage points. The latter finding implies that the effects of more frequent recertification on case closure may be proportionally larger for correct cases than for error cases.

The estimates obtained here for the effect of more frequent recertification on program participation among households with earnings is similar to that found in two recent econometric studies that used pooled cross-sectional time-series data at the state level.¹ In contrast, the effects estimated here on the error rate for earnings cases is less favorable than the error rate reductions found in the earlier research.

These preliminary findings suggest that more frequent recertification for cases with earnings may have effects that are more pronounced in reducing the rate of participation than in reducing the rate of error. As intended, shorter certification periods are shown to lead to higher closure rates for error cases than would otherwise occur through interim action. It also appears, however, that more frequent recertification leads to higher closure rates for correct cases, mitigating the intended reduction in the case error rate.

¹ See Kabbani and Wilde (2003) and Kornfeld (2002).

Chapter One: Background and Objectives

This research on food stamp error rates has three major objectives:

- to examine recent year-to-year national trends in error rates as affected by three food stamp administrative processes—initial certification, interim action, and recertification;
- to examine state-by-state differences in error rates and to diagnose the performance of low-error and high-error states in terms of their effectiveness at conducting initial certification, interim action, and recertification; and
- to examine the extent to which more frequent recertification, as a measure intended to reduce payment error especially among cases with earnings, may also unintentionally reduce program participation.

This research uses a probability model to explain the underlying month-to-month dynamics of the annually measured food stamp case error rate and the level of food stamp participation among U.S. households.

The food stamp administrative processes examined here—initial certification, recertification, and interim action—influence the monthly opening and closing of food stamp cases, and the extent to which active food stamp cases are correctly or incorrectly paid. With respect to recertification, specific attention is given to both the accuracy of recertification decisions and the frequency of recertification. Of particular interest are the patterns of participation and error among cases with earnings. A motivating concern for this research is that the use of short certification periods (three months or less in duration) as a strategy to reduce error among cases with earnings may reduce program participation among such households; thus, some that are circumstantially eligible for assistance may be discouraged from participating by the added procedural requirements.

Two recent studies have provided evidence supporting the proposition that short certification periods tend to reduce food stamp participation for cases with earnings.

- Using national quality control (QC) data for 1990 through 2000, Kabbani and Wilde (2003) found that a 10-percentage-point increase in the proportion of cases subject to short certification periods was associated with a caseload decline of 2.6 percent for households with earnings. Under this same scenario, the corresponding reduction in the payment error rate was estimated at 0.8 percentage points (compared to the state average error rate of 13.1 percent).

- Kornfeld (2002) also obtained estimates of the effect on food stamp participation of a 10-percentage-point increase in the proportion of cases subject to short certification periods, using national QC data for 1987 through 1999. He found the associated caseload decline to be 2.3 percent for cases with adults living separately and 2.4 percent for cases comprised of multiple adults with children.

Trends in Food Stamp Participation and Error

To set the context for this research, we review here the major national trends in the rates of food stamp participation and error that occurred during federal fiscal years 1997 through 2001. This is the five-year period that followed the enactment of major federal policy reforms to cash assistance and food stamps under the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) of 1996 (P.L. 104-193, enacted August 22, 1996 and first effective on October 1, 1996, the start of fiscal year 1997). Exhibit 1 shows key national statistics relating to food stamp participation. During this period the following national trends are noteworthy. (All of the changes noted here at the national level since 1997 are statistically significant, based on tests that make use of the standard errors of the national point estimates.)

- The monthly food stamp caseload declined from 9.452 million households in 1997 to 7.335 million in 2000, before rising to 7.450 million in 2001. The percentage of cases with earnings rose from 24.2 percent to 27.2 percent between 1997 and 2000 and then declined to 26.7 percent in 2001. The percentage of total benefits paid to cases with earnings also rose, from 26.8 percent to 33.7 percent between 1997 and 2000, and then dropped slightly to 33.3 percent in 2001.²
- Among individuals eligible for food stamps, the estimated participation rate declined from 64.0 percent in 1997 to 61.6 percent in 2001.³ For program-eligible individuals in households with earnings, the “conditional” participation rate fell slightly from 52.9 percent in 1997 to 52.1 percent in 2001. In both instances, the rate moved downward during 1998 and 1999 and then upward in the following two years.

² For a detailed analysis of the factors influencing food stamp caseloads between 1987 and 1999, see Kornfeld (2002).

³ Alternative estimates show national food stamp participation rates among program-eligibles that are higher in each year than those noted here, but with a similar trend over time. In Shirm and Castner (2002), the national participation rate was estimated at 60 percent for 1998, 58 percent for 1999, and 59 percent for 2000.

Exhibit 1: National Food Stamp Program Indicators, 1997-2001

	1997	1998	1999	2000	2001
Annual food stamp benefits (fiscal year, billions)^a	\$19.5	\$16.9	\$15.8	\$15.0	\$15.5
Monthly food stamp caseload (households in thousands)^a	9,452	8,246	7,670	7,335	7,450
Percentage of food stamp households with earnings (%)^a	24.2	26.3	26.8	27.2	26.7
Percentage of benefits paid to households with earnings (%)^b	26.8	30.2	33.1	33.7	33.3
“Conditional” participation rate (among eligible individuals, %)^c					
Individuals in all households	64.0	59.8	58.8	59.7	61.6
Individuals in households with earnings	52.9	49.9	42.7	50.9	52.1
Average length of certification period (months)^a					
Total food stamp households	9.9	9.9	9.7	9.6	9.7
Food stamp households with earnings	8.1	7.8	7.5	7.2	7.3
Cases with certification period of 3 months or less (%)^a					
Total food stamp households	12.1	15.0	16.9	18.5	17.2
Food stamp households with earnings	25.6	30.5	32.9	36.5	33.1

Sources:

- Food and Nutrition Service, U.S. Department of Agriculture, "Characteristics of Food Stamp Households," fiscal years 1997-2001.
- Food and Nutrition Service, U.S. Department of Agriculture, "Food Stamp Quality Control Annual Report," fiscal years 1997-2001. Overpayment error includes payments to ineligible cases and overpayments to eligible cases. Underpayment error includes underpayments to eligible cases.
- Karen Cunyningham, "Trends in Food Stamp Program Participation Rates: 1994 to 2000," Mathematica Policy Research, June 2002; and Karen Cunyningham, "Trends in Food Stamp Program Participation Rates: 1999 to 2001," Mathematica Policy Research, July 2003. The indicated participation rates are for September of each year. We use the term "conditional" participation rate to distinguish this measure from the later-defined "aggregate" participation rate.
- Beginning in 2000, the error tolerance was raised from \$5 to \$25 in classifying eligible cases as overpaid or underpaid.

- The average length of assigned certification periods declined between 1997 and 2000, but then rose slightly in 2001. For total cases, the average length dropped from 9.9 to 9.7 months over the entire period. The reduction was more pronounced for cases with earnings, from 8.1 to 7.3 months. Exhibits A-1, A-2, and A-3 in Appendix A show the detailed distribution of food stamp households by length of certification period, for total households, households with earnings, and households without earnings, respectively.
- Contributing to the reduced average length of certification periods was the more prevalent use of certifications of three months or less. The percentage of all cases assigned to these “short” certification periods rose from 12.1 to 18.5 percent between 1997 and 2000, but then dropped to 17.2 percent in 2001. For cases with earnings, the corresponding increase was from 25.6 to 36.5 percent during 1997-2000, declining to 33.1 percent in 2001.

During this same time period, USDA allowed states increasing flexibility to adopt reporting systems that eased the requirements upon clients for reporting income changes or other circumstantial changes within a certification period. Some of the new options (such as quarterly or semiannual reporting) called for less frequent client reporting of changes affecting one’s eligibility or benefit. Other options (such as status reporting) limited the reporting requirement only to major shifts in one’s employment situation. This increasing federal flexibility was intended to encourage program participation, reduce administrative burdens, and help states control their error rates.

The trends in food stamp error rates during this period are somewhat difficult to track because of a change in error measurement instituted in 2000. Beginning in that year, the error tolerance was raised from \$5 to \$25 for eligible cases. Thus, eligible cases with variances of \$5 to \$24 are now considered correctly paid, although previously they were considered in error. This change did not affect the error findings for ineligible cases, which are considered in error (overpaid) regardless of their monthly benefit. Nor did this affect the error findings for negative actions (denials and terminations of assistance).

Exhibit 2 shows the national error rates during 1997-2001 for active cases and for negative actions (denials and terminations). For active cases, the exhibit shows both the dollar error rates (dollars in error as a percentage of total dollars paid) and case error rates (active cases in error as a percentage of total active cases); these error rates are shown for overpayment errors (payments to ineligible cases and overpayments to eligible cases), underpayment errors (underpayments to eligible cases), and combined errors.

Exhibit 2: National Food Stamp Error Rates, 1997-2001

	1997	1998	1999	2000	2001
Active cases^a					
Overpayment dollar error rate (%)	7.28	7.63	7.01	6.51 ^b	6.47 ^b
Underpayment dollar error rate (%)	2.47	3.07	2.85	2.40 ^b	2.19 ^b
Total dollar error rate (%)	9.75	10.70	9.86	8.91 ^b	8.66 ^b
Standard error (%)	0.17	0.17	0.18	0.18	0.18
Overpayment case error rate (%)	15.18	15.98	14.27	9.92 ^b	9.54 ^b
Underpayment case error rate (%)	8.51	9.42	9.05	4.64 ^b	4.56 ^b
Total case error rate (%)	23.68	25.40	23.32	14.56 ^b	14.11 ^b
Distribution of overpayment dollars (%)					
Households with earnings	38.17	43.57	49.14	49.83	53.21
Households without earnings	61.83	56.43	50.86	50.17	46.79
Total	100.00	100.00	100.00	100.00	100.00
Negative actions (denials and terminations)^a					
Negative case error rate (%)	3.25	2.44	2.61	3.57	5.49

Sources:

- a. Food and Nutrition Service, U.S. Department of Agriculture, "Food Stamp Quality Control Annual Report," fiscal years 1997-2001. Overpayment error includes payments to ineligible cases and overpayments to eligible cases. Underpayment error includes underpayments to eligible cases. All estimates include Guam and Virgin Islands.
- b. Beginning in 2000, the error tolerance was raised from \$5 to \$25 in classifying eligible cases as overpaid or underpaid.

The published error rates for active cases generally rose slightly from 1997 to 1998, fell marginally from 1998 to 1999, fell dramatically from 1999 to 2000 (reflecting to some degree the change in error measurement), and then fell slightly from 2000 to 2001. In contrast, the negative case error rate rose between 1998 and 2001. It is important to note that all of these measures are sample-based and that some of the national year-to-year changes are not statistically significant. For the total dollar error rate (whose standard error is shown in Exhibit 2), all year-to-year changes are statistically significant except for that between 2000 and 2001.

During this period, errors among cases with earnings comprised an ever-growing share of national overpayment dollars. By 2001, as shown in Exhibit 2, such cases were responsible for 53.2 percent of overpayment dollars, much larger than their 26.7 percent share of active cases and their 33.3 percent share of total benefit dollars in that year (shown in Exhibit 1).

Developments in Food Stamp QC Policy

Since the early 1980s, food stamp error rates have been a focus of attention among states as a result of federal policies making states vulnerable to some loss of federal funds (“fiscal liabilities”) for failing to meet national error rate standards.⁴ During the period examined, the national error rate standard was the national average of the total dollar error rate.

Starting in 1998, the imposition of a liability on a state with an above-average error rate also depended on the share of the state’s caseload comprised of households with earnings and households with immigrants.⁵ For each state subject to a “potential liability,” an adjusted error rate was calculated by assuming that the caseload shares comprised by households with earners and households with immigrants equaled the national shares in a base year. (For liabilities in 1998 and 1999, the base year was 1996. Starting with 2000, the base year was moved back to 1992, to remove the effect on the adjustment formula of state welfare-to-work initiatives that raised the caseload share of working poor households between 1992 and 1996.)

Only those states whose unadjusted and adjusted error rates both exceeded the national average for a given year then became subject to an “adjusted liability.” The liability amount was calculated on a sliding scale, depending on the difference between the state’s adjusted error rate and the national average. The number of states subject to adjusted liabilities was 16 in 1998, 16 in 1999, 18 in 2000, and 15 in 2001. The adjusted liability amounts totaled \$27 million in 1998, \$31 million in 1999, \$46 million in 2000, and \$134 million in 2001. (Of

⁴ See Affholter and Kramer (1987), Chapter 3.

⁵ The following discussion draws heavily from Rosenbaum and Super (2001).

the total liability amount in 2001, \$114 million was associated with California, whose total dollar error rate was 17.37 percent.)⁶

States subject to adjusted liabilities typically entered into negotiation with USDA regarding federal collection of these sanctions. Under these settlements, USDA agreed to waive outright some liability amounts, with states committing to reinvest some amounts in management improvements aimed at reducing error. USDA also then regarded other liability amounts as “at risk,” or subject to future collection, if the state’s error rate performance did not improve in the following years.

Another component of food stamp QC policy has been the financial incentive of “enhanced funding” of administrative costs (normally matched federally at 50 percent) for states whose total dollar error rate is below 6 percent and whose negative case error rate is below the national average. As with fiscal liabilities, the amount of enhanced funding is computed on a sliding scale, depending on the difference between the state’s performance and 5.9 percent. The number of states subject to enhanced funding was 6 in 1998, 6 in 1999, 11 in 2000, and 10 in 2001. (The increase in the latter two years reflected in part the raising of the error threshold for eligible cases from \$5 to \$25.) The amount of enhanced funding in total was \$27 million in 1998, \$39 million in 1999, \$55 million in 2000, and \$52 million in 2001. (For each of these years, Texas accounted for more than half of the nationwide amount of enhanced funding.)

⁶ Food and Nutrition Service (May 24, 2002).

Chapter Two: Modeling Program Participation and Error

This analysis' modeling approach focused on the underlying research questions, the available program data, and the intrinsic nature of food stamp administrative procedures. The research builds upon previous work by Abt Associates on the effects of recertification and monthly reporting on food stamp error rates.⁷ Importantly, however, the current research goes beyond the earlier work, in the following respects:

- By incorporating food stamp participation, as well as food stamp error, as an outcome of administrative procedures;
- By relaxing the previous modeling assumption that the observed error rates reflect a system already at equilibrium in any given year; and
- By undertaking state-by-state estimates, as well as national estimates, of the model.

The foundation for this work, however, remains the concept that the food stamp administrative process can be represented as a discrete-time, multi-status probability model.⁸ The basic unit of observation is the household, and the basic unit of time is the month. At the start of any given month, each household is considered as occupying one of several possible groups regarding their participation in the program and the accuracy of their payment.

The simplest form of such a model is the discrete-time Markov chain, a stochastic process in which the conditional distribution of each unit's future status is dependent on its present status, but is independent of any prior history. The system is thus considered "memoryless." There is a very substantial body of literature on Markov chains, and the attached bibliography identifies a very small subset of the published work. Appendix E shows a formal specification of discrete-time Markov chains.

Under a Markov model, the period-by-period operations of a real-world system are described in terms of a matrix of transition probabilities. The transition probabilities indicate the pattern of changes in the status of items—in this instance, the status of households regarding their food stamp participation and the correctness of their benefit—as time advances from one period to the next—in this context, from one month to the next. The estimated transition

⁷ See Mills (1988).

⁸ To avoid confusion in the current research, we use the word "status" rather than "state" in referring to the condition occupied by a household with respect to the Food Stamp Program. We reserve the use of "state" in referring to the 50 states and the District of Columbia.

matrix can then be used to simulate the effect on the system’s performance of operational changes. The particular application of Markov modeling here is to examine the effect of the more frequent food stamp recertification on the size of the active food stamp caseload and the error rate among active cases.

Illustrative Models

In describing below the methodology of a discrete-time Markov chain, we first introduce a basic two-group model and then move progressively to the five-group model used in the analysis.

Two-Group Model

The basic two-group model can be used to examine changes over time in the percentage of households that are food stamp participants. We refer to this percentage as the “aggregate participation rate,” expressed as p_t in any given month t . In this simple model, the household population can be viewed as divided into two subgroups: food stamp nonparticipants and food stamp participants.⁹ The condition of the system in any given month can be described by p_t .

From one month to the next, any given household can either shift from one group to the other or can remain within its group. We can describe the monthly dynamics of this system using a two-by-two transition matrix, as shown in Exhibit 3. *The entries of the transition matrix indicate the probability that a household of given status in the current month (as indicated by the associated row) will have the same status or a different status in the next month (as indicated by the associated column).* The entries in each row are conditional probabilities that sum to 1, fully describing the transitions that can occur for a household, given its current-month status.

Exhibit 3: Transition Matrix for Two-Group Model

		Next-month status:	
		Nonparticipating	Participating
Current-month status:	Nonparticipating	1 - a	a
	Participating	b	1 - b

⁹ In this study, we use the term “aggregate participation rate” to refer here to the percentage of *all* households that participate in the program. This is to distinguish it from the alternative measure (referred to here as the “conditional participation rate”) that indicates the percentage of *program-eligible* households that participate.

The parameter “a” indicates the “case opening rate”—the probability that a household not receiving food stamps in one month will participate in the next month. Correspondingly, the parameter “b” represents the “case closure rate”—the probability that a household receiving food stamps in one month will not participate in the following month. This modeling approach assumes that each parameter does not depend on the length of time that a household has been in its current group. It also assumes that each parameter remains constant over time.

The system’s condition will change predictably from one month to the next. In particular, the percentage of households participating in the next month, p_{t+1} , can be expressed as a function of p_t , a, and b as follows:

$$(Eq. 1) \quad p_{t+1} = [(1-p_t) a] + [p_t(1-b)].$$

Depending on the values of a and b, the system will approach a long-term equilibrium.¹⁰ From Eq. 1, one can derive the steady-state value of the aggregate participation rate, p^* , by solving for $p_{t+1} = p_t$. Doing so, one finds that:

$$(Eq. 2) \quad p^* = a/(a+b)$$

The value of p^* is thus a function of the transition probabilities only and does not depend on the starting value of p_t .

Three-Group Model

One can elaborate on this basic two-group model by allowing a participating household to be either a correct case or an error case. In any given month, households can thus occupy one of three groups: nonparticipating households (group 1), correctly paid cases (group 2), and incorrectly paid cases (group 3). In this model, the condition of the system in month t is described by the three percentages (summing to one) that indicate the proportion of all households in each group: nonparticipating (n_t), correct (c_t), and error (e_t). The system can be regarded as having two key outcome statistics. One indicator, as before, is the aggregate participation rate, p_t . In the notation of the three-group model, $p_t = c_t + e_t = 1 - n_t$. The other indicator is the case error rate, r_t , the percentage of active cases that are in error in month t. In the terms of the model, $r_t = e_t/(c_t + e_t) = e_t/p_t$.

For this three-group model, the month-to-month transitions are fully described in the three-by-three matrix shown in Exhibit 4. As with the matrix for the two-group model, the entries

¹⁰ There are some combinations of a and b for which no equilibrium is reached (for instance, if a=1 and b=1), but such scenarios are implausible ones that do not reflect the real-world monthly dynamics.

in each row sum to one. We have introduced subscripts for each cell entry (p_{ij}) to indicate the specific transition from group i in the current month to group j in the next month.

Exhibit 4: Transition Matrix for Three-Group Model

	Next-month status:		
Current-month status:	Nonparticipating	Correct	Error
Nonparticipating	p_{11}	p_{12}	p_{13}
Correct	p_{21}	p_{22}	p_{23}
Error	p_{31}	p_{32}	p_{33}

This three-by-three matrix provides a simplified representation of the monthly dynamics that underlie the case error rate. In any given month, the opening rate (indicated by “a” in the two-group model) is now the sum of p_{12} and p_{13} . Note that the error rate among initially certified cases is $p_{13}/(p_{12}+p_{13})$. The probability that a correct case becomes in error the following month is p_{23} . The probability that an error case becomes correct the following month is p_{32} . The probability that an error case leaves the active caseload is p_{31} .¹¹ This model does not enable one to examine the separate roles of interim action and recertification in controlling errors among active cases.

Five-Group Model

To address the issue of more frequent recertification and its effects on both participation and error in food stamps, the model must be further elaborated. We have done this by subdividing food stamp cases according to whether or not their current certification is about to expire (i.e., “ongoing” versus “expiring”), in addition to whether or not their benefit is in error. The five-by-five transition matrix is shown in Exhibit 5, with row totals again summing to one.

This formulation allows the dynamics of participation and error to be expressed separately for initial certifications (in the first row), interim actions (in the second and third rows), and recertifications (in the fourth and fifth rows). More frequent recertifications affect participation and error by subjecting cases to the conditional probabilities for expiring cases (in the fourth and fifth rows) rather than the conditional probabilities for ongoing cases (in the second and third rows).

¹¹ As indicated in Chapter Three, one can derive the equilibrium value of the case error rate (r^*), as e^*/p^* , where p^* is the equilibrium value for the share of all households that are food stamp participants (as defined above) and e^* is the equilibrium value for the share of all households that are error cases.

Exhibit 5: Transition Matrix for Five-Group Model

Current-month status:	Next-month status:				
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error
Nonparticipating	p_{11}	p_{12}	p_{13}	p_{14}	p_{15}
Ongoing correct	p_{21}	p_{22}	p_{23}	p_{24}	p_{25}
Ongoing error	p_{31}	p_{32}	p_{33}	p_{34}	p_{35}
Expiring correct	p_{41}	p_{42}	p_{43}	p_{44}	p_{45}
Expiring error	p_{51}	p_{52}	p_{53}	p_{54}	p_{55}

The condition of the system in any given month is now described by the five percentages indicating the shares of the total household population that are nonparticipating households (group 1), ongoing correct cases (group 2), ongoing error cases (group 3), expiring correct cases (group 4), or expiring error cases (group 5). As these categories are mutually exclusive and collectively exhaustive, the corresponding shares of the population will always sum to one.

Modeling Approach Adopted for This Study

With the preceding discussion as background, we now develop more formally the five-group model used in this study.

At the start of any given month, we regard each U.S. household as belonging to one of the following five groups, according to whether the household is participating in the Food Stamp Program and (if so) whether the household's food stamp payment is correct and whether the household is in the final month of its current food stamp certification period:

1. households not participating in the Food Stamp Program (“nonparticipating”);
2. correctly paid food stamp cases, not in their final certification month (“ongoing correct”);
3. incorrectly paid food stamp cases, not in their final certification month (“ongoing error”);
4. correctly paid food stamp cases, in their final certification month (“expiring correct”); and
5. incorrectly paid food stamp cases, in their final certification month (“expiring error”).

From one month to the next, each household may experience a transition from one group to another or may remain in its group. *One can express the pattern of month-to-month changes in status in a five-by-five transition matrix. The entries in this matrix are transition probabilities of the form p_{ij} , indicating the probability that a household in group i in one month will enter group j in the following month (where i may equal j).*

In developing the initial estimates reported here, we have made several simplifying assumptions that rule out some month-to-month transitions. The corresponding entries in the transition matrix are thus set to zero by definition.

- We assume that a nonparticipating household (Group 1) cannot transition immediately to being an expiring case (i.e., in Group 4 or 5 as an active case in its final certification month). That is, we regard the shortest certification length as two months. (For the 0.5 percent of cases found in the data to have one-month certification periods, we treat these as two-month periods.)
- We also assume that active cases in their final certification month (Group 4 or 5) cannot remain in that group for more than one month at a time. That is, a case that becomes due for certification would not then proceed to being overdue for recertification.¹²

These assumptions are made to avoid having cells in the basic transition matrix that are occupied by a trivially small number of cases. In such instances, the simplifying assumptions serve to combine these negligible categories of cases into adjacent cells of the matrix, with negligible effect on the resulting estimates.

The purpose of adopting this general framework is that it enables the case error rate to be modeled in terms of three distinct administrative processes: initial certification, interim action, and recertification. In the terms of the model, the case error rate can be expressed as the number of households in Groups 3 and 5 divided by the number of households in Groups 2 through 5.

This model focuses on the *combined* or *total* case error rate, the percentage of active cases that are either ineligible, eligible but overpaid, or eligible but underpaid, including both agency-related and client-related error. The methodological approach could easily be used to construct separate models for the overpayment case error rate (including both the ineligible and those eligible but overpaid) and the underpayment case error rate (those eligible but underpaid). Alternatively, one could focus solely on agency-related error or client-related error. We examine the total measure here for several reasons. First, as noted above, federal standards for food stamp error are based on the combination of overpayment and

¹² The assumption also reflects a recognized limitation of the QC data. As will be explained later, the QC data do not accurately identify all cases that are overdue for recertification.

underpayment errors among active cases. The combined measure is thus the focus of executive and legislative attention. Second, to the extent that errors of both overpayment and underpayment are generated jointly from the same administrative process, it would be inappropriate for the analysis to separate them artificially, implying that one is independent of the other or that one carries more significance than the other.¹³

The decision to focus on the total *case* error rate, rather than the total *dollar* error rate, is a pragmatic one. The total case error rate, defined as the ratio of active cases in error to total active cases, is a proportional outcome bounded between zero and one for any set of cases. All active cases contribute equally to the denominator; each case contributes either zero or one to the numerator. In contrast, the total dollar error rate, the ratio of error dollars among active cases to total dollars paid to these cases, can potentially range higher than one for any set of cases. Moreover, cases contribute unequally to the denominator, depending on the magnitude of their monthly benefit, which is itself a function of the error amount. Their contribution to the numerator is also a continuous variable, as small as zero (for correct cases) and as large as the full benefit payment (for ineligible cases).

Arithmetically, the total dollar error rate equals the product of the total case error rate and the ratio of the average monthly dollar error amount to the average monthly benefit payment to an active case. A state's total case error rate is highly correlated with its total dollar rate. For Fiscal Year 2001, the correlation between these two measures was 0.923, implying that more than 85 percent (0.853) of the variation in the dollar error rate can be explained by the case error rate.¹⁴

¹³ Similarly, separate models could be constructed for agency-related error and client-related error. The distinction between the two error types can be somewhat arbitrary, however, and one needs to establish rules for classifying multiple-error cases that contain both agency and client errors.

¹⁴ The correlation coefficient of 0.923 is based on state-reported values of the total case error rate and the official values of the total dollar error rate in fiscal year 2001, for the 50 states and the District of Columbia.

Chapter Three: Deriving the Transition Matrix

The study's basic analytic construct is a five-by-five matrix of transition probabilities that indicate month-to-month patterns of food stamp participation and error. This chapter describes how the transition matrix is derived from available national data, through a five-by-five crosstabulation of households according to their food stamp status in one month and in the following month.

Exhibit 6 shows the generic notation used to identify the cell entries of the basic crosstabulation. Rows of the matrix correspond to current-month status; columns correspond to next-month status. Illustratively, as explained later, we regard the current month as March and the next month as April. The household count in row i and column j (the cell entry Q_{ij}) indicates the number of households in group i at the start of a month who then belong to group j at the start of the following month. In each month, every household is considered to belong in one (and only one) of the five specified groups.

Representing Food Stamp Administrative Procedures

This formulation of the model is chosen as a way of describing food stamp participation rates and error rates as outcomes of month-to-month household changes, with an explicit focus on initial certification, interim action, and recertification as distinct stages in the food stamp administrative process.

Initial Certification

The initial certification process is represented by the first row of the matrix. This row corresponds to households that at the start of the current month are not receiving food stamps but who may transition into the program in the subsequent month. For nonparticipating households at the start of the current month, their distribution at the start of the next month depends on whether: (a) they remain nonparticipants (Q_{11}), (b) they become correct cases (Q_{12}), or (c) they become error cases (Q_{13}). As noted above, we make the simplifying assumption that newly-certified cases are not assigned a one-month certification period; this implies that Q_{14} and Q_{15} are both zero.

Interim Action

The interim action process is represented by the second and third rows of the matrix. These rows correspond to ongoing food stamp cases—households that at the start of the current month are active cases not subject to recertification (i.e., not in the final month of their certification period), and are either correct (second row) or in error (third row). Consider the

Exhibit 6: Basic Transition Matrix

Current-month ("March") status	Next-month ("April") status					Total (row)
	Non- participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Number of households						
Nonparticipating	Q ₁₁	Q ₁₂	Q ₁₃	Q ₁₄ =0	Q ₁₅ =0	R ₁
Ongoing correct	Q ₂₁	Q ₂₂	Q ₂₃	Q ₂₄	Q ₂₅	R ₂
Ongoing error	Q ₃₁	Q ₃₂	Q ₃₃	Q ₃₄	Q ₃₅	R ₃
Expiring correct	Q ₄₁	Q ₄₂	Q ₄₃	Q ₄₄ =0	Q ₄₅ =0	R ₄
Expiring error	Q ₅₁	Q ₅₂	Q ₅₃	Q ₅₄ =0	Q ₅₅ =0	R ₅
Total (column)	C ₁	C ₂	C ₃	C ₄	C ₅	Q
Data source (see Notes below)	(a)	(b)	(b)	(b)	(b)	(c)

Notes:

- First-column entries and total: calculated as row residuals.
- Second-, third-, fourth-, and fifth-column entries and totals: estimated from current-year QC data.
- Row totals: The values for R₁ through R₅ are derived on the basis of linear interpolation between the current-year and prior-year distribution of households, as explained in the text. The value for Q (total households in the population) is obtained from Census data for April of each year.

second row, the ongoing correct cases. In the next month such a household can either: (a) become a nonparticipating household (Q_{21}); (b) remain a correct case, not in its final certification month (Q_{22}); (c) become an error case, not in its final certification month (Q_{23}); remain a correct case, in its final certification month (Q_{24}); or become an error case, in its final certification month (Q_{25}). Similar month-to-month transitions can occur for ongoing error cases—i.e., error cases in the midst of a certification period. The corresponding third-row cell entries are Q_{31} , Q_{32} , Q_{33} , Q_{34} , and Q_{35} .

Recertification

The recertification process is represented by the fourth and fifth rows of the matrix. These rows correspond to expiring cases: cases that in the current month are in the final month of their certification period, either correct (fourth row) or in error (fifth row). Consider the fourth row—the expiring correct cases. The recertification about to be conducted on such a case will result in the household's either: (a) becoming a nonparticipating household (Q_{41}); (b) remaining correct (Q_{42}); or (c) becoming in error (Q_{43}). Similar month-to-month transitions can occur for expiring error cases—those incorrectly paid in the final month of their certification period (corresponding to Q_{51} , Q_{52} , and Q_{53}). We assume that cases subject to recertification do not become overdue for recertification and that newly-recertified cases are not assigned a one-month certification period (implying that Q_{44} , Q_{45} , Q_{54} , and Q_{55} are all zero).

Using National Food Stamp Quality Control Data

The primary data source for this analysis is the national Food Stamp Program Quality Control (FSPQC) system. Each year a nationally representative sample of between 45,000 and 50,000 active food stamp cases is selected for QC review, to assess the accuracy of eligibility and benefit determinations made by the administering state and local program agencies. Annual samples range from 300 to 2,400 by state, depending on the size of each state's average monthly active caseload. Approximately one-twelfth of a state's annual sample is drawn each month for review by state QC reviewers. The QC review consists of an inspection of the case record, an interview with the household, and additional field investigation that may include contacts with collateral sources such as employers, landlords, and banks. The information recorded by the state QC reviewers is assembled into a national QC database by USDA's Food and Nutrition Service. National and state error rates are calculated using this database.¹⁵

¹⁵ A subsample of each state's QC sample is then subject to validation by federal QC staff, and the official error statistics incorporate the findings of both the state reviews and federal re-reviews. The federal re-review findings are not used in this study, as the federal subsample is about one-third the size of the full QC sample.

The decision to represent household transitions on a month-by-month basis reflects the fact that the active case QC data describe the status of cases in monthly terms. Specifically, the national QC database provides information about the presence of error for sample cases in their review month, along with information enabling one to deduce their participation and error status in the prior month. ***In the model developed here, we use the term “next month” to refer to the QC review month.*** The term “current month” refers to the month prior to the review month.

The model makes no assumption about whether the current-month distribution of households across the five groups (as indicated by the row totals, R_i) is the same as the next-month distribution (as indicated by the column totals, C_i). The expected situation, for the nation or for any particular state, is that the distribution of households is in short-term flux from one month to the next. The estimates derived in this analysis reflect such short-term month-to-month fluctuations. In general, the nature of a Markov model is such that the monthly transitions will (if uninterrupted) lead to a stable long-term distribution of households. The modeling approach here does ***not*** assume, however, that the nation or any individual state has already reached such an equilibrium.

As described below, the task of empirically deriving the model is a matter of using the national QC sample data on active food stamp cases (along with Census data on the total household population) to arrive at cell counts for the basic transition matrix. These cell counts, appropriately weighted to account for the QC sampling procedures, are then used to compute the transition probabilities. One can view the estimation as an accounting process whereby households are placed within the five-by-five classification according to their status in the review month and the preceding month. As described below, a number of assumptions are required to overcome the limitations of the QC data.

In principle, one would want to derive the model separately for each calendar month. This would mean, for instance, that one would calculate twelve separate monthly models over any given annual interval. The monthly sample sizes in the national QC data—approximately 4,000 cases reviewed per month—are not sufficient, however, to support the monthly derivation of the model, even at the national level. This is because some of the monthly transitions in question are based on small segments of the active caseload—for example, cases with earnings that are in error at the final month of their certification period. Moreover, some of the transitions in question are relatively rare events, occurring with a probability of less than 5 percent.

For these reasons, we have chosen to estimate the national model using the full QC sample for a federal fiscal year (October through September). ***We assume that the month-to-month pattern of change is the same in each of the twelve months of the fiscal year.*** The estimates for the year in question are thus not specific to any particular calendar month; there is no assumed intra-year variation in monthly error patterns.

Under this approach, *we have found it helpful (although not necessary) to consider the data for each fiscal year as having been collected in the mid-year review month of April.* We thus interpret the month-to-month transitions as March-to-April transitions. In Exhibit 6, we show the current-month status as referring to “March” and the next-month status as referring to “April.”

The active case QC data and Census data allow us to estimate directly some, but not all, cell counts in the matrix. Most notably, the number of cases that exit from the caseload each month is not observed in the active case QC data and must be estimated indirectly as a row or column residual. The resulting closure rates are subject to variation, as they reflect the sampling error of all elements entering the calculation. Exhibit 6 indicates which cell entries are estimated directly from QC data or indirectly as row or column residuals. *The first-column entries of the matrix correspond to households that are not participating in the review month (“April”). They are not observed in the active case QC data. These cell counts thus cannot be directly computed and must be derived.* If one knows the row totals of the matrix—that is, the preceding (“March”) monthly count of households in each of the five subgroups—one can compute each first-column entry as a row residual (i.e., by subtracting all other row entries from the row total).

We have calculated the basic matrix of cell counts for each year 1998 through 2001 using national data from the food stamp QC reviews of active cases. We have excluded Guam and the Virgin Islands from the analysis, as the necessary Census data on annual household counts do not include the territories.¹⁶

Exhibit 7 shows the total number of food stamp QC cases included in the analysis, for 1997 through 2001.

¹⁶ The annual QC data files, including details on error cases not included in public-use data sets, were made available to us by Mathematica Policy Research (MPR), at the request of the Food and Nutrition Service (FNS). We wish to acknowledge the assistance provided by Jenny Genser of FNS and Karen Cunnyngham of MPR in making the detailed data available for this analysis.

Exhibit 7: Size of the Analysis Sample, 1997-2001

	1997	1998	1999	2000	2001
Number of food stamp quality control cases					
Households with earnings	11,968	12,460	12,925	12,683	12,459
Households without earnings	35,977	33,896	33,702	33,383	33,686
Total households	47,945	46,356	46,627	46,066	46,145

Note: Analysis sample excludes Guam and Virgin Islands.

Several adjustments to the data were necessary, as follows:

- To establish a consistent error standard for the historical period, we retroactively applied to the 1997, 1998, and 1999 data the \$25 error tolerance for active cases that were eligible for food stamps. As noted earlier, this QC policy provision was first effective in 2000. Thus, for each of the years analyzed here, an eligible active case was considered correct if the monthly benefit differed from the correct amount by \$24 or less. (There is no error tolerance for active cases that are ineligible.) Prior to 2000, the error tolerance for active cases was \$5. Consistency across years required use of the \$25 tolerance rather than the \$5 tolerance, as it was not possible to apply the \$5 tolerance to cases in 2000 and 2001. (We are unable to identify the eligible cases with error amounts of \$5 to \$24, as these cases were found correctly paid and no error amount was recorded.) As shown in Exhibit 8, approximately one-third of the cases classified as errors in 1997-1999 were eligible cases with overpayment or underpayment of \$5 to \$24. Such cases were reclassified as correct in this analysis, to establish a consistent error definition.
- We considered cases with a one-month certification period as having a two-month certification period. This was to avoid the calculation of some transition probabilities on the basis of very small samples. Note that less than 0.5 percent of all sample cases were assigned a one-month certification period. (Separately, two cases with an indicated certification length of 0 were excluded from the analysis.)

Exhibit 8: National Case Error Rates with \$5 and \$25 Error Tolerance, 1997-2001

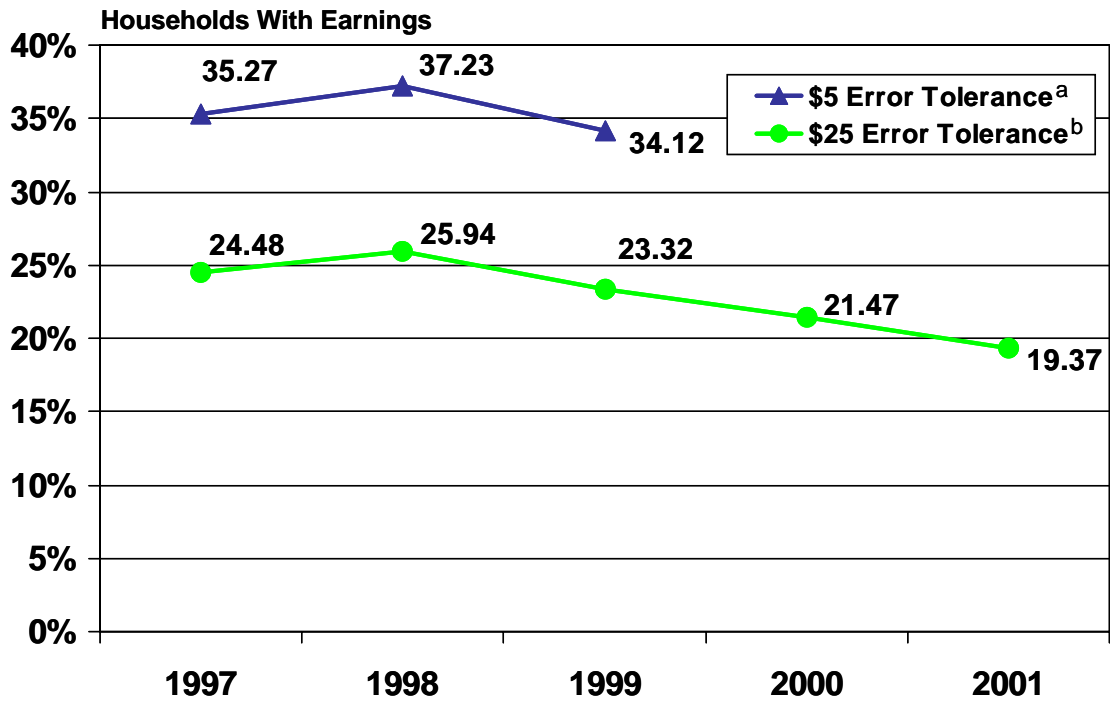
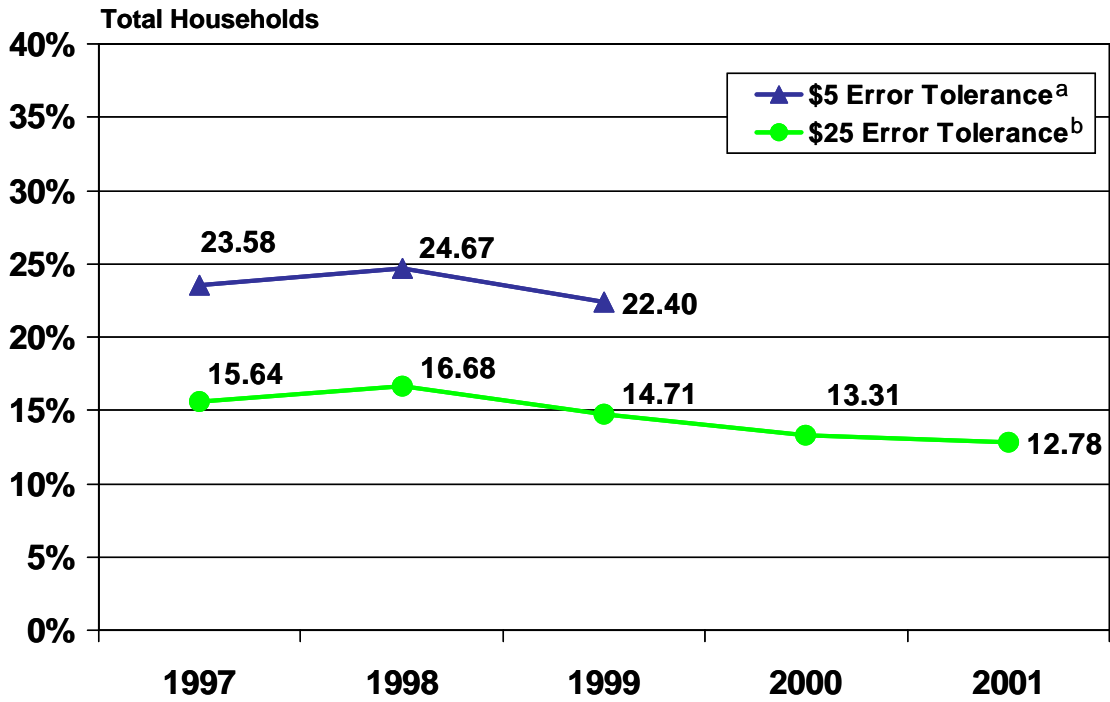
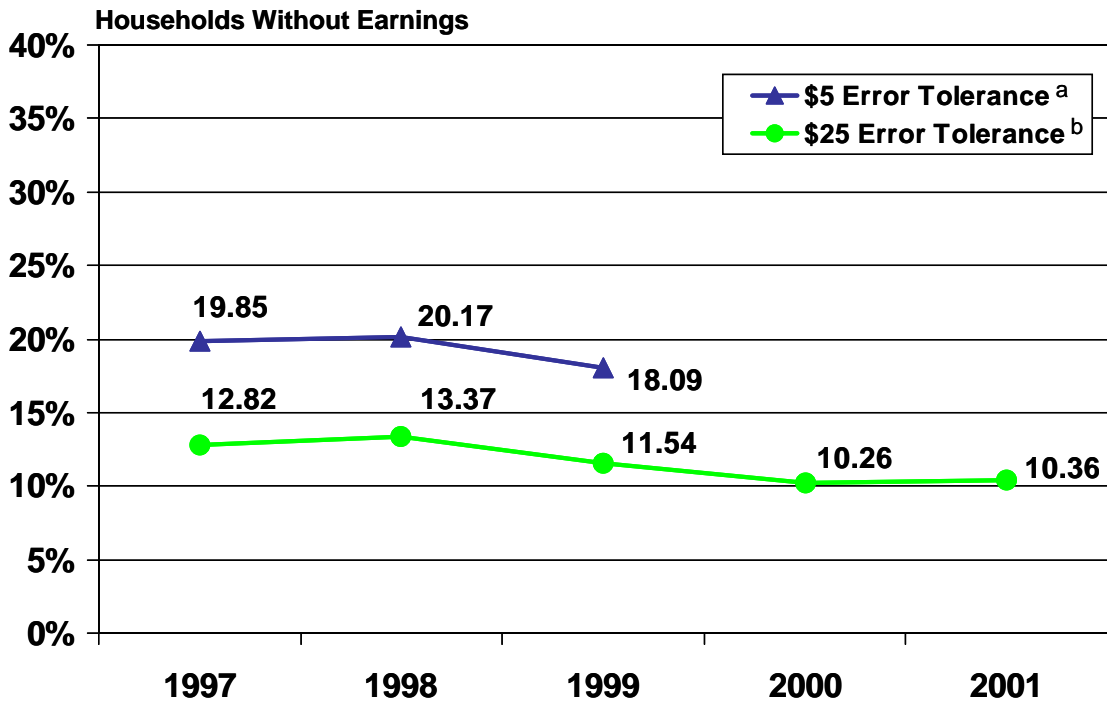


Exhibit 8: National Case Error Rates with \$5 and \$25 Error Tolerance, 1997-2001
(Continued)



Notes:

^a Eligible cases with overpayment or underpayment of less than \$5 are not classified as error cases. (Data not available for 2000 and 2001, as explained in text.)

^b Eligible cases with overpayment or underpayment of less than \$25 are not classified as error cases.

The distinction between cases with earnings and cases without earnings is based on whether the case record indicates the presence of earnings. To some degree, errors among cases “without earnings” are associated with unreported earnings amounts. The model does not address explicitly the extent to which households move between the “with earnings” and “without earnings” categories.

Calculation of Cell Counts and Transition Probabilities

The model’s rules for determining cell counts within the five-by-five transition matrix are described in Appendix B. In applying these rules, one uses the information from the QC review to infer the prior-month status of active cases. We tested numerous alternative specifications of these rules, with specific attention to the resulting closure rates. One consideration was to minimize the number of instances of *negative* group-specific closure rates. Such anomalous values were present to some degree under all specifications, reflecting the variability of the weighted sample data as well as possible oversimplification in the modeling assumptions.

We applied the procedures in Appendix B in calculating the cell entries within the five-by-five matrix nationally for 1998 through 2001. For 2001, these estimates are shown in Exhibit 9. (Appendix Exhibits C-1 through C-4 show the estimates for each of the four years). We then used the estimated cell counts to compute the associated transition probabilities for each period. These are shown in Exhibit 10 for 2001 (and in Appendix Exhibits C-5 through C-8 for all four estimated years). For any given year, the transition probabilities in each row sum to 1, as they are computed by dividing each cell count by its corresponding row total. To recall, each transition probability p_{ij} indicates the probability that a household of status i in the current month will occupy status j in the next month.

Derivation of Row Totals

The row totals in the basic transition matrix (R_1 through R_5 in Exhibit 6) represent the current-month (March) distribution of households. ***Row totals cannot be directly estimated from the QC data, because cases that have just closed (the first entry in each row) are not observed in the next-month (April) QC data.*** Some simplifying assumption is thus required to derive these row totals, which can then in turn be used to calculate the number of case closures.

In this section, we discuss at some length the approach used in setting the row totals. The modeling assumptions here deserve attention, for several reasons. First, there are a number of different approaches that one can take, with no compelling logic pointing toward any single correct method. Second, to the extent that different approaches yield different closure rates, the model's estimates will vary according to one's choice of method.

In principle, one would ideally want the marginal totals in the basic transition matrix to reflect both (a) the change from one month to the next in the total population of households and (b) the shift from one month to the next in the distribution of households among the five groups, within the total population count. The approach adopted here is to derive the row totals in such a way as to incorporate the month-to-month distributional shift, as described below, but not the month-to-month population change. The assumption of a constant total population within a given fiscal year is only a very slight abstraction from reality, as the monthly trend rate of national population growth during this period was 0.1 percent.

The model assumes that, over the course of a fiscal year, the change in the distribution of households takes place in twelve equal monthly steps. ***The month-to-month change in the distribution of households across the five groups is computed as one-twelfth of the observed year-to-year change in the household distribution.***

Exhibit 9: Cell Counts, 2001

Current-month ("March") status	Next-month ("April") status					Total (row)
	Non- participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Total households (in thousands)						
Nonparticipating	98,385	574	57	0	0	99,015
Ongoing correct	485	4,302	337	633	56	5,814
Ongoing error	23	380	360	2	63	829
Expiring correct	72	509	58	0	0	640
Expiring error	51	56	14	0	0	121
Total (column)	99,015	5,821	827	636	119	106,418
Households with earnings (in thousands)						
Nonparticipating	83,049	190	29	0	0	83,268
Ongoing correct	141	846	160	211	29	1,387
Ongoing error	43	159	102	1	27	331
Expiring correct	10	169	33	0	0	212
Expiring error	25	28	4	0	0	58
Total (column)	83,268	1,391	329	212	56	85,257
Households without earnings (in thousands)						
Nonparticipating	15,318	384	27	0	0	15,729
Ongoing correct	344	3,456	177	422	27	4,427
Ongoing error	0 *	221	259	1	36	517
Expiring correct	60	340	25	0	0	425
Expiring error	25	28	10	0	0	63
Total (column)	15,747	4,430	498	423	63	21,161

Note: Row (or column) entries may not sum to the indicated row (or column) total due to rounding. Asterisk (*) indicates an imputed zero value.

Exhibit 10: Transition Probabilities, 2001

Current-month ("March") status	Next-month ("April") status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Total households						
Nonparticipating	0.994	0.006	0.001	0.000	0.000	1.000
Ongoing correct	0.083	0.740	0.058	0.109	0.010	1.000
Ongoing error	0.028	0.459	0.435	0.003	0.076	1.000
Expiring correct	0.113	0.796	0.091	0.000	0.000	1.000
Expiring error	0.420	0.462	0.119	0.000	0.000	1.000
Households with earnings						
Nonparticipating	0.997	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.102	0.610	0.116	0.152	0.021	1.000
Ongoing error	0.128	0.480	0.307	0.004	0.081	1.000
Expiring correct	0.049	0.795	0.157	0.000	0.000	1.000
Expiring error	0.440	0.484	0.076	0.000	0.000	1.000
Households without earnings						
Nonparticipating	0.974	0.024	0.002	0.000	0.000	1.000
Ongoing correct	0.078	0.781	0.040	0.095	0.006	1.000
Ongoing error	0.000*	0.445	0.520	0.002	0.072	1.039
Expiring correct	0.141	0.800	0.059	0.000	0.000	1.000
Expiring error	0.395	0.447	0.158	0.000	0.000	1.000

Note: Row entries may not sum to the indicated row total due to rounding. Asterisk (*) indicates an imputed zero value.

To illustrate the linear interpolation method used to calculate the row totals for the annual national estimates, we describe below how we calculated the national row totals for the 2001 matrix; these are the marginal row totals shown in the top panel of Exhibit 9. As previously noted, we refer to these row totals as the “March 2001” estimates, as they represent the distribution of households one month before the “April 2001” column totals.

Columns (a) through (f) of Exhibit 11 show the calculations for this example. In this exhibit, the weighted household counts are not rounded. The corresponding numbers in Exhibit 8, as elsewhere in the report, are rounded to the nearest thousand.

The steps in the calculation of the March 2001 row totals are as follows:

- Start with the household counts determined in the prior year, 2000. These “April 2000” counts (by group) are the column totals from the top panel of Exhibit C-3, as repeated in column (a) of Exhibit 11. For the four subgroups of active cases, these counts are obtained directly from the 2000 QC data. The total household count for April 2000 (104.705 million, from Census data) is used to derive the April 2000 count of nonparticipating households, as a residual.
- Compute the 2000 (“April 2000”) percentage distribution of households across the five groups. This is shown in column (b) of Exhibit 11.
- Apply the percentage distribution of households in column (b) to the national population base for April 2001 (106.418 million, from Census data), thus deriving the counts for each group that would result if the percentage distribution of households had remained unchanged from 2000 to 2001 (i.e., from April 2000 to April 2001). These counts are shown in column (c) of Exhibit 11. This step is in keeping with the model’s focus on the aggregate participation rate (versus the number of active cases) and on the case error rate (versus the number of error cases).
- Column (d) shows the household counts for 2001 (“April 2001”), as shown in the column totals in the top panel of Exhibit 9. Compute the average monthly change for each group as 1/12 of the difference between the “April 2001” household count in column (d) and the population-adjusted “April 2000” household count in column (c). For each group, this average monthly change is shown in column (e). It can be either a positive or negative value. By definition, the average monthly changes for the five groups sum to zero.

Exhibit 11: Calculating "March 2001" Row Totals for FY 2001 Transition Matrix

Household group	FY2000 ("April 2000") count	FY2000 ("April 2000") distribution	FY2000 distribution, applied to FY2001 population	FY2001 ("April 2001") count	Average monthly change, FY2000 to FY2001	FY2001 ("March 2001") row total
	(a)	(b)	(c)	(d)	(e)	(f)
Nonparticipating	97,415,884	93.04%	99,009,632	99,015,357	477	99,014,880
Ongoing correct	5,642,513	5.39%	5,734,826	5,821,020	7,183	5,813,837
Ongoing error	832,461	0.80%	846,080	827,098	-1,582	828,680
Expiring correct	676,094	0.65%	687,155	635,508	-4,304	639,812
Expiring error	138,048	0.13%	140,306	119,017	-1,774	120,791
Total	104,705,000	100.00%	106,418,000	106,418,000	0	106,418,000

See column
totals in
top panel of
Exhibit C-3

$=(a)/104,705,000$

$=(b)*106,418,000$

See column
totals in
top panel of
Exhibit C-4

$=[(d)-(c)]/12$

$=(d)-(e)$
See row
totals in
top panel of
Exhibit C-4

- For each group, compute the marginal row total for 2001 (“March 2001”) by subtracting the average monthly change from the 2001 (“April 2001”) count. The result of this calculation is shown in column (f). These counts, rounded to the nearest thousand, then appear as the marginal row totals in the top panel of Exhibit 9.¹⁷

The marginal row totals provide the basis for calculating the number of monthly case closures for each of the defined subgroups of active cases (ongoing correct, ongoing error, expiring correct, and expiring error). Case closures are not observed in the active case QC data and also cannot be derived by group from negative action QC data. The marginal row totals allow one to compute the number of closures as the row residual. These closure counts comprise the first column of the basic transition matrix. Although the cell counts elsewhere in the five-by-five matrix are not contingent on the marginal row totals, the row totals form the denominators for computing the transition probabilities in each row.

Long-Term Outcomes Implied by the Transition Matrix

One advantage of the Markov modeling approach is that the estimated transition matrix can be used to compute the projected long-term distribution of households across the specified groups. This projected steady-state distribution is the system outcome that would ultimately occur if the process of month-to-month transitions were to continue indefinitely. One can expect that shifts in the underlying pattern of participation and error, such as those associated with more frequent recertification, will play themselves out progressively over time. For this reason, it is useful to assess such shifts in terms of the long-run outcomes.

In the previous chapter, the equilibrium value of the aggregate participation rate was derived for the two-group model as $a/(a+b)$, where a is the case opening rate and b is the case closure rate. We show below the formulas for deriving the equilibrium values for the aggregate participation rate (p^*) and the case error rate (r^*) from the five-group model, using the notation introduced in Exhibit 6. These formulas express each of these long-term outcomes as a function of the associated opening rates and closure rates. In turn, these opening rates and closure rates are computed from cell counts contained in the basic transition matrix.

The formula below for the long-term participation rate is a direct extension of the calculation shown earlier for the two-group model. The long-term case error rate is derived below as a ratio of two proportions, both expressed as shares of the total household population. One (e^*) is the long-term share of the population consisting of error cases; the other (p^*) is the long-term participation rate.

¹⁷ In this particular example, the computed marginal row total for nonparticipating households, 99.015 million (for “March 2001”), equals the corresponding first-column total, also 99.015 million (for “April 2001”). These two values are not equal by assumption.

$$\begin{aligned} \text{Long-term aggregate participation rate} &= p^* \\ &= a/(a+b) \end{aligned}$$

$$\begin{aligned} \text{Where } a &= \text{case opening rate} \\ &= (Q_{12} + Q_{13})/R_1 \end{aligned}$$

$$\begin{aligned} b &= \text{case closure rate} \\ &= (Q_{21} + Q_{31} + Q_{41} + Q_{51})/(R_2 + R_3 + R_4 + R_5) \end{aligned}$$

$$\begin{aligned} \text{Long-term case error rate} &= r^* \\ &= e^*/p^* \end{aligned}$$

$$\begin{aligned} \text{Where } e^* &= \text{aggregate error rate} \\ &= c/(c+d) \end{aligned}$$

$$\begin{aligned} c &= \text{error opening rate} \\ &= (Q_{13} + Q_{23} + Q_{24} + Q_{43})/(R_1 + R_2 + R_4) \end{aligned}$$

$$\begin{aligned} d &= \text{error closure rate} \\ &= (Q_{31} + Q_{32} + Q_{34} + Q_{51} + Q_{52})/(R_3 + R_5) \end{aligned}$$

Using these formulas, Exhibit 12 shows the long-term participation rate and case error rate implied by the 2001 transition matrices for total households, households with earnings, and households without earnings. For each segment of the population, the matrices imply a slight downward or stable path for both the participation rate and the error rate.¹⁸

¹⁸ An alternative specification of the model was suggested by the Economic Research Service, employing a different approach to the calculation of row totals in the transition matrix that yielded lower case closure rates. This alternative model was considered but was not adopted, in part because the long-term outcomes implied by the transition matrix appeared less credible than those shown in Exhibit 12. In particular, under the alternative formulation, the long-term participation rate for total households was 7.91 percent, implying a substantial increase in the active caseload. The corresponding long-term case error rate was 11.03 percent.

Exhibit 12: Projected Long-Term Outcomes, Based on 2001 Matrix

	Observed FY 2001 value (%)	Projected long-term value (%)
Total households		
Aggregate participation rate	6.96	6.95
Case error rate	12.78	12.72
Households with earnings		
Aggregate participation rate	2.33	2.33
Case error rate	19.37	19.19
Households without earnings		
Aggregate participation rate	25.58	24.86
Case error rate	10.36	10.28

Source: Based on formulas shown in text, using the transition matrices derived for 2001 (see Exhibit 9).

Chapter Four: National Trends in Program Participation and Error Rates

Recent national trends in food stamp participation and error are examined in this chapter. The annually estimated model is used here to examine the patterns that underlie year-to-year changes in the rate at which households participate in the program (the aggregate participation rate) and the rate at which active cases are incorrectly paid (the case error rate).

Underlying Trends in Participation Rates

The model produces a series of statistics pertaining to the monthly size, composition, and dynamics of the active food stamp caseload. The first of these is a general indicator of food stamp receipt within the household population, in a given month. (The definitions below use the notation from Exhibit 6.)

- **Aggregate participation rate**
 - = percentage of all households that are active cases
 - = $(C_2 + C_3 + C_4 + C_5)/Q$

For 1997 through 2001, Exhibit 13 shows the average monthly number of active food stamp cases, the total number of U.S. households, and the corresponding aggregate participation rate. (Recall that this is distinct from the “conditional” participation rate that shows the percentage of *eligible* households that participate in the program.) Estimates are shown separately for total households, households with earnings, and households without earnings.

There are three caseload share parameters, summing to one, that indicate the proportion of the active caseload comprised by first-month cases, ongoing cases, or expiring cases:

- **Caseload share: first-month cases**
 - = percentage of active cases that are newly certified
 - = $(Q_{12} + Q_{13})/(C_2 + C_3 + C_4 + C_5)$
- **Caseload share: ongoing cases**
 - = percentage of active cases that are subject to interim action
 - = $(C_2 + C_3 - Q_{12} - Q_{13})/(C_2 + C_3 + C_4 + C_5)$
- **Caseload share: expiring cases**
 - = percentage of active cases that are subject to recertification
 - = $(C_4 + C_5)/(C_2 + C_3 + C_4 + C_5)$

Exhibit 13: Aggregate Participation Rates, 1997-2001

	1997	1998	1999	2000	2001
Total households					
Number of food stamp cases (thousands)	9,393	8,196	7,612	7,289	7,403
Number of U.S. households (thousands)	101,018	102,528	103,874	104,705	106,418
Aggregate participation rate (%)	9.3%	8.0%	7.3%	7.0%	7.0%
Households with earnings					
Number of food stamp cases (thousands)	2,273	2,158	2,048	1,985	1,989
Number of U.S. households (thousands)	79,790	81,248	82,611	84,184	85,257
Aggregate participation rate (%)	2.8%	2.7%	2.5%	2.4%	2.3%
Households without earnings					
Number of food stamp cases (thousands)	7,120	6,038	5,564	5,304	5,414
Number of U.S. households (thousands)	21,228	21,280	21,263	20,521	21,161
Aggregate participation rate (%)	33.5%	28.4%	26.2%	25.8%	25.6%

Sources and notes: Number of food stamp cases—weighted count of participating cases, from the analysis sample shown in Exhibit 7. Number of U.S. households—U.S. Department of Commerce, Bureau of the Census, Current Population Survey in March of each year. (See www.census.gov/hhes/income/dinctabs.html.) Aggregate participation rate—number of food stamp cases divided by the corresponding total number of U.S. households.

Exhibit 14 shows the annual estimates of these parameters, for 1998 through 2001. Over this period there was a slight increase in the caseload share associated with first-month cases and a slight decline in the share associated with expiring cases. These trends occurred both for households with earnings and without earnings. For both types of households, the caseload share associated with ongoing cases remained stable and large (more than three-fourths of active cases). In later explaining national error trends, it will be important to recognize that ongoing cases comprise so large a segment of the active caseload.

Exhibit 14: Caseload Shares, 1998-2001

	1998	1999	2000	2001
Total households				
Caseload share (%):				
First-month cases	7.0	7.6	7.8	8.5
Ongoing cases	81.3	81.5	81.0	81.3
Expiring cases	11.8	10.8	11.2	10.2
Households with earnings				
Caseload share (%):				
First-month cases	8.6	9.0	10.1	11.0
Ongoing cases	76.2	76.4	74.3	75.5
Expiring cases	15.2	14.6	15.6	13.5
Households without earnings				
Caseload share (%):				
First-month cases	6.4	7.1	7.0	7.6
Ongoing cases	83.1	83.5	83.5	83.4
Expiring cases	10.5	9.4	9.5	9.0

One can also define the closure rates, indicating the percentage of cases that exit the active caseload in each month:

- **Closure rate: total cases**
 = closure rate among all active cases
 = $(Q_{21} + Q_{31} + Q_{41} + Q_{51}) / (R_2 + R_3 + R_4 + R_5)$
- **Closure rate: ongoing cases**
 = closure rate among active cases subject to interim action
 = $(Q_{21} + Q_{31}) / (R_2 + R_3)$

- **Closure rate: expiring cases**
 = closure rate among active cases subject to recertification
 = $(Q_{41} + Q_{51}) / (R_4 + R_5)$

Exhibit 15 shows the estimated closure rates provided by the model. As noted earlier, the monthly closure rates for active cases are subject to considerable sampling error, as they are computed as the residual of sample-estimated values in each row of the matrix. The estimated monthly closure rate for total active cases ranged between 8.2 and 8.5 percent during this period. Estimated closure rates were somewhat higher for households with earnings (9.5 to 12.3 percent) than for households without earnings (7.4 to 7.9 percent).

Exhibit 15: Closure Rates, 1998-2001

	1998	1999	2000	2001
Total households				
Closure rate (%):				
Total cases	8.4	8.3	8.2	8.5
Ongoing cases	4.9	6.4	6.0	7.6
Expiring cases	33.6	24.5	26.2	16.2
Households with earnings				
Closure rate (%):				
Total cases	12.3	9.5	10.5	11.0
Ongoing cases	9.7	7.1	8.0	10.7
Expiring cases	27.2	23.4	23.9	13.0
Households without earnings				
Closure rate (%):				
Total cases	7.9	7.9	7.4	7.9
Ongoing cases	4.4	6.1	5.3	7.0
Expiring cases	36.9	24.7	27.5	17.4

For total active cases, the model yields monthly closure rates higher than those for June 2000 shown in *Food Stamp Program Access Study: Local Office Policies and Practices*.¹⁹ Compared to the estimates here for fiscal year 2000, Bartlett et al. found the closure rate to be 5.4 percent for total cases (versus the 8.2 percent above), 2.9 percent for ongoing cases (versus the 6.0 percent above), and 21.9 percent for expiring cases (versus the 26.2 percent above).

¹⁹ See Bartlett et al. (2004). The study derived its nationally representative estimates for June 2000 from data collected at 109 local food stamp offices.

The higher rates here for total closures and interim closures appear to reflect some overstatement in the number of first-month (newly certified) cases and a corresponding understatement in the number of second-month (ongoing) cases and expiring cases. As noted earlier, the share of the caseload comprised by first-month cases was estimated here at 7.8 percent in FY 2000 (compared to 4.9 percent for Bartlett et al.). This higher-than-expected proportion of new openings may result from the way in which QC reviewers enter information on the timing of the initial certification in relation to the review month. Some of these cases (now classified in cells Q₁₂ and Q₁₃ of Exhibit 6) should perhaps be classified as in their second month and thus as ongoing cases. Any misclassifications of this type have the effect of raising the rate of new openings, the total closure rate, and the interim closure rate. In other instances, cases that are overdue for recertification (and should be classified as expiring) may be misclassified as first-month cases, given the instructions to QC reviewers for entering information on “sample month in certification.”²⁰

Can any other data be used to indicate whether the closure rates estimated here are indeed higher than one should have expected? For any given fiscal year, it is possible to derive an “implied monthly closure rate” based on information regarding the monthly active caseload and the number of monthly case openings. To do this, one starts with the following identity: the net monthly change in active cases equals monthly case openings minus monthly case closings. Rearranging terms, it follows that: monthly case closings equal monthly case openings minus the net monthly change in active cases.

We have applied this relationship to compute implied monthly closure rates for 1998 through 2001, using national administrative data from FNS on monthly caseloads and also using the counts of monthly case openings calculated in this study from the annual QC data. As shown in Exhibit 16, the implied monthly closure rates are in the range of 7.7 to 8.0 percent during this period, compared to 8.2 to 8.5 percent for the model. This suggests that the monthly closure rates provided by the model may be somewhat overstated, but not to the degree suggested by the comparison with Abt’s other recently completed study. We acknowledge that the implied closure rates calculated in Exhibit 16 do not provide a truly independent test, as they rely on the counts of case openings computed from the QC data analyzed here. To our knowledge, however, there is no independent source of data on food stamp case openings.

²⁰ For the data element “sample month in certification,” FNS Handbook 310 instructs QC reviewers that “this entry should indicate how far into the certification period the sample month occurs.” The instructions go on to say, however, that “for households that are participating in months for which they have not been certified, enter the number of months beyond the end of the household’s certification period.” This implies that a case one month overdue for recertification could be misclassified as a newly certified case. Consistent with this logic, the 11.2 percent caseload share for expiring cases in 2000 (shown in Exhibit 14) is lower than the corresponding 12.5 percent from Bartlett et al. (2004).

Exhibit 16: Monthly Closure Rates Implied by Year-to-Year Change in National Caseload

Fiscal Year	Monthly caseload at start of current year	Monthly caseload at start of next year	Change in caseload over 12 months	Average monthly caseload change	Average monthly openings	Implied average monthly closings	Average monthly caseload	Implied monthly closure rate
	(a)	(b)	(c) =(b)-(a)	(d) =(c)/12	(e)	(f) =(e)-(d)	(g)	(h) =(f)/(g)
1998	8,658,521	7,858,938	-799,583	-66,632	571,574	638,206	8,248,741	0.077
1999	7,858,938	7,440,073	-418,865	-34,905	580,617	615,522	7,668,372	0.080
2000	7,440,073	7,315,526	-124,547	-10,379	571,395	581,774	7,324,628	0.079
2001	7,315,526	7,812,305	496,779	41,398	630,323	588,925	7,446,981	0.079

Sources:

- (a) Food and Nutrition Service, National Data Bank, caseload in first month of current fiscal year.
- (b) Food and Nutrition Service, National Data Bank, caseload in first month of next fiscal year.
- (e) Abt Associates, Exhibits C-1 through C-4 of this report, sum of cell counts Q₁₂ and Q₁₃ for total households.
- (g) Food and Nutrition Service, National Data Bank, average caseload over the twelve months of current fiscal year.

Underlying Trends in Error Rates

Study findings are derived from the five-by-five transition matrices calculated nationwide and by state, using the annual QC data. The matrices are used to compute a series of parameters that underlie the total case error rate. These parameters are defined below, using the notation from Exhibit 6 relating to cell counts (Q_{ij}), column totals (C_j), and row totals (R_i) in the transition matrix.

- **Total error rate**
 - = case error rate among all active cases
 - = $(C_3 + C_5)/(C_2 + C_3 + C_4 + C_5)$
- **First-month error rate**
 - = case error rate among first-month (newly certified) cases
 - = $Q_{13}/(R_1 - Q_{11})$
- **Next-month error rate: ongoing correct cases**
 - = next-month case error rate among current-month ongoing correct cases
 - = $(Q_{23} + Q_{25})/(R_2 - Q_{21})$
- **Next-month error rate: ongoing error cases**
 - = next-month case error rate among current-month ongoing error cases
 - = $(Q_{33} + Q_{35})/(R_3 - Q_{31})$
- **Next-month error rate: expiring correct cases**
 - = next-month case error rate among current-month expiring correct cases
 - = $Q_{43}/(R_4 - Q_{41})$
- **Next-month error rate: expiring error cases**
 - = next-month case error rate among current-month expiring error cases
 - = $Q_{53}/(R_5 - Q_{51})$

The denominator for each error rate is the number of cases that are active in the next month, within the corresponding caseload group.²¹

²¹ Several aspects of this study should be re-emphasized, to avoid confusion. First, for expositional ease we refer to case transitions as occurring from the “current” month to the “next” month. The expected pattern of these month-to-month transitions is derived from QC data, indicating case status in the review month and enabling us to infer the case status in the prior month. One should thus regard the QC review month as the “next” month; the month preceding the QC review is the “current” month. Second, the term “expiring cases” refers to cases that are not necessarily closing; instead, these are cases that are at the end of their certification period and are thus subject to a recertification.

The first-month error rate is a measure of payment accuracy at initial certification. The next-month error rates for ongoing cases indicate the effectiveness of interim actions at preventing errors (among ongoing correct cases) and at detecting and correcting errors (among ongoing error cases). Similarly, the next-month error rates for expiring cases indicate the effectiveness of recertifications at preventing errors (among cases that are correct as they enter recertification) and at detecting and correcting errors (among cases that are in error as they enter recertification).

In general, the modeling approach yields parameter estimates at the national level that either remain stable or trend progressively upward or downward over the period 1998 to 2001. Exhibit 17 shows the above-defined key error indicators by year, for total households and for the two subgroups (households with and without earnings). The major descriptive findings are as follows:

- **Total error rate**—On a consistently measured basis, the total error rate steadily declined during these years, from 16.7 percent in 1998 to 12.8 percent in 2001 for the total caseload.²² As typically observed in QC data, the error rate for cases with earnings (19.4 percent in 2001) was consistently about twice as high as that for cases without earnings (10.4 percent in 2001).
- **First-month error rate**—The error rate for newly certified cases (reflecting the errors that occur at initial certification) declined markedly during these years (from 12.2 percent in 1998 to 9.0 percent in 2001 for total cases). This was partly responsible for the reduction in the case error rate, especially in light of the growing caseload share comprised by first-month cases (as explained below, from 7.0 percent in 1998 to 8.5 percent in 2001). As with the total error rate, the first-month error rate was about twice as high for cases with earnings (13.2 percent in 2001) as for cases without earnings (6.6 percent in 2001).

²² These model-derived case error rates differ from those shown in Exhibit 2 for several reasons. First and most importantly, the model applies a consistent \$25 error threshold for all years. (In Exhibit 2, the error rates prior to 2000 reflect a \$5 error threshold. As shown in Exhibit 8, in those years approximately one-third of recorded errors amounted to less than \$25 for eligible cases.) Second, Guam and the Virgin Islands are excluded from the model-derived estimates.

Exhibit 17: Error Rates, 1998-2001

	1998	1999	2000	2001
Total households				
Total error rate (%)	16.7	14.7	13.3	12.8
First-month error rate (%):	12.2	10.8	8.9	9.0
Next-month error rate (%):				
Ongoing correct cases	9.6	8.2	7.7	7.4
Ongoing error cases	75.5	61.8	57.0	52.5
Expiring correct cases	11.8	11.5	9.4	10.2
Expiring error cases	38.6	29.4	25.0	20.0
Households with earnings				
Total error rate (%)	25.9	23.3	21.5	19.4
First-month error rate (%)	18.9	16.8	13.5	13.2
Next-month error rate (%):				
Ongoing correct cases	20.0	17.5	17.3	15.2
Ongoing error cases	66.1	54.6	50.5	44.8
Expiring correct cases	19.3	19.5	15.6	16.3
Expiring error cases	35.5	18.9	19.4	12.1
Households without earnings				
Total error rate (%)	13.4	11.5	10.3	10.4
First-month error rate (%)	9.0	8.1	6.5	6.6
Next-month error rate (%):				
Ongoing correct cases	6.4	5.3	4.7	5.0
Ongoing error cases	80.4	66.0	61.3	57.1
Expiring correct cases	7.7	7.3	5.8	6.8
Expiring error cases	40.7	36.4	30.6	26.3

- Next-month error rate: ongoing correct cases*—During these years there was a decline in the rate at which, in the midst of a certification period, correct cases became in error the following month. This might reflect greater month-to-month stability in household circumstances among food stamp cases. It also may reflect some improvement in the extent to which interim actions prevented errors from occurring. This rate dropped from 9.6 percent in 1998 to 7.4 percent in 2001. The decline was especially pronounced among cases with earnings, from 20.0 percent in 1998 to 15.2 percent in 2001. Even with this lowering, the rate for earnings cases remained approximately three times the rate for cases without earnings (5.0 percent in 2001).

- Next-month error rate: ongoing error cases***—There was also a marked decline in the rate at which ongoing error cases remained in error the next month, a measure of the extent to which interim actions serve to detect and correct errors). This rate was 52.5 percent for total cases in 2001, and it was much lower for cases with earnings (44.8 percent) than for cases without earnings (57.1 percent). For both caseload segments, these rates dropped by more than 20 percentage points between 1998 and 2001. It is interesting to note that errors among cases with earnings appear less likely to persist from one month to the next (in comparison to the errors among cases without earnings). It may be that reporting systems are better at capturing income changes than other changes in household circumstances.
- Next-month error rate: expiring correct cases***—The percentage of correct cases that became in error upon recertification remained stable during this period, equaling 10.2 percent for total cases in 2001 (16.3 percent for cases with earnings and 6.8 percent for cases without earnings). This measure reflects the extent to which errors are newly created in the course of a recertification. Errors can arise at recertification if, for instance, a caseworker misapplies policies in acting on new information about the household’s circumstances. It is seemingly for this reason (i.e., agency-related errors at recertification) that the onset of error occurs at a higher rate among expiring correct cases than among ongoing correct cases (10.2 percent versus 7.4 percent for 2001), as recertifications presumably serve to reduce the onset of client-related errors. Note also that the rate of error onset is higher among newly-recertified cases than among those initially certified (10.2 percent versus 9.0 percent in 2001). This may reflect a greater degree of attention (and caseworker labor) devoted by program offices to initial certifications than to recertifications, on a per-case basis.
- Next-month error rate: expiring error cases***—The percentage of expiring error cases that remained in error in the course of recertification was 20.0 percent in 2001, showing a dramatic reduction from 38.6 percent in 1998. This “error survival rate at recertification” (the rate at which errors escape detection and correction at recertification) was less than half as large for cases with earnings (12.1 percent) than for cases without earnings (26.3 percent). As was noted above for ongoing cases, errors among cases without earnings tend to be more persistent than errors among cases with earnings.

To summarize these results, the reduction in the national case error rate from 16.7 percent in 1998 to 12.8 percent in 2001 reflected improvements both for cases with earnings and for cases without earnings. For both caseload segments, one minor factor was the drop in error rates at initial certification, accentuated by the fact that first-month cases came to comprise an increasing share of the caseload. Far more important, however, was the reduction in next-month error rates for ongoing cases. As noted earlier, such cases comprise the bulk of the

active caseload. The major contributing factor was the dramatic decline in the next-month error rate for ongoing error cases. It appears that interim action procedures became much better at detecting and correcting errors between formal case actions. Also noteworthy, but of lesser importance in explaining the national error trend, was the drop in the next-month error rate for expiring error cases. Both for cases with and without earnings, recertification procedures appeared to capture and correct more errors.

To the extent that there was a reduction in the next-month error rates for ongoing cases, it is difficult to know whether this occurred more as a result of (a) the adoption by states of new client reporting systems that were more error-tolerant or (b) the improved administrative performance of states under client reporting systems that remained largely unchanged. In 1998-2001, the Food and Nutrition Service increasingly granted waivers allowing states to adopt reporting systems that were more forgiving.²³ For instance, quarterly or semiannual reporting systems tended to ease the burdens upon both clients and agencies to respond to household changes affecting the monthly benefit, by extending the time interval allowed for reporting circumstantial changes. States could also adopt “status reporting”, which limited the household’s obligation to report changes in earnings to those situations involving major shifts in employment status. However, not until 2001 did the Food and Nutrition Service collect systematic information on the client reporting systems used by states, making it impossible to assess the effect of changes in reporting systems on error rate trends.

The comparison of error patterns between cases with and without earnings is informative. The higher case error rate among cases with earnings results from the higher probability that such cases will be in error at initial certification or (if correct at intake) will later fall into error. Errors among cases with earnings tend not to persist as long, however, as such error cases are more likely (than error cases without earnings) to leave the caseload during interim months or at recertification. Stated otherwise, errors tend to both start and end at a higher rate among cases with earnings than among cases without earnings.

²³ See, for instance, Rosenbaum (2000).

Chapter Five: State-by-State Error Patterns

State-by-state patterns are discussed in this chapter. The model can be used to help explain the variation in states' error rates, by diagnosing whether a state's errors are attributable to errors among first-month cases (at initial certification), among ongoing cases (at interim action), or among expiring cases (at recertification). This information is especially important for planning corrective actions, so that one can focus attention on the phase of the administrative process that is most responsible for errors.

Historically, food stamp error rates have shown substantial interstate variation. For FY 2001, as shown in Exhibit 18, the total case error rate ranged from 4.46 percent in South Dakota to 31.12 percent in California.

Deriving State-Specific Models

We calculated the model for each state and the District of Columbia using the state's pooled QC sample for the period 1998-2001. Initially, state-specific single-year models were computed. For states with annual QC samples of fewer than 800 cases, the majority of all states, sampling variability resulted in considerable year-to-year changes in the estimated transition probabilities. For this reason, and because of the desire to compare the model's results across all states, it was decided to pool the data across years for each state.

As with the single-year estimates at the national level, row totals were first derived for each state's multi-year model. In the state-specific models, as in the national estimates, the row totals (R_1 through R_5) represent the current-month distribution of households. As with the national estimates, the row totals assume that the change in the distribution of households takes place in twelve equal monthly steps for each year. For each state, the average month-to-month changes for each of the four years 1998-2001 are themselves averaged and are then used to derive the row totals for the state's multi-year estimates. Stated otherwise, we assume that the change in the distribution of households over the four-year period takes place in 48 equal monthly steps.

Exhibit 19 shows for each state the distribution of active cases between households with earnings and households without earnings. For any given state, the respective sizes of these caseload segments will affect the role played by the respective error rate parameters for cases with and without earnings in influencing the state's total error rate.

Exhibits 20, 21, and 22 show the key error findings from the state-by-state models. These exhibits display the previously defined case error indicators, for total households (Exhibit 20), households with earnings (Exhibit 21), and households without earnings (Exhibit 22). In each exhibit, the state values of each error indicator that lie in the bottom quartile of the

distribution are shown in bold. These states are the exemplary performers with respect to that error indicator.

The underlying cell counts and transition probabilities are shown by state in Appendix D.

Exhibit 18: Case Error Rates by State, Fiscal Year 2001

State	Overpayment case error rate (%)	Underpayment case error rate (%)	Total case error rate (%)
Alabama	12.82	2.99	15.81
Alaska	13.61	5.38	18.99
Arizona	6.76	3.86	10.62
Arkansas	4.46	2.04	6.50
California	20.00	11.12	31.12
Colorado	10.78	4.70	15.48
Connecticut	9.79	5.29	15.08
Delaware	11.18	5.80	16.98
District of Columbia	12.42	5.70	18.12
Florida	10.16	4.34	14.50
Georgia	7.74	2.51	10.25
Hawaii	8.83	5.68	14.51
Idaho	8.37	4.28	12.65
Illinois	9.50	3.13	12.63
Indiana	7.83	3.84	11.67
Iowa	8.87	2.38	11.25
Kansas	10.71	3.39	14.10
Kentucky	8.08	3.57	11.65
Louisiana	7.88	4.03	11.91
Maine	9.46	5.27	14.73
Maryland	9.01	4.00	13.01
Massachusetts	9.05	4.47	13.52
Michigan	12.21	6.30	18.51
Minnesota	5.69	3.05	8.74
Mississippi	4.93	2.63	7.56
Missouri	10.74	4.18	14.92
Montana	11.32	3.70	15.02
Nebraska	11.83	3.23	15.06
Nevada	8.07	3.16	11.23
New Hampshire	9.75	4.18	13.93

Exhibit 18: Case Error Rates by State, Fiscal Year 2001 (Continued)

State	Overpayment case error rate (%)	Underpayment case error rate (%)	Total case error rate (%)
New Jersey	8.03	3.42	11.45
New Mexico	8.79	3.08	11.87
New York	7.06	6.26	13.32
North Carolina	7.75	2.10	9.85
North Dakota	4.69	3.19	7.88
Ohio	8.06	3.70	11.76
Oklahoma	10.29	3.33	13.62
Oregon	12.37	3.11	15.48
Pennsylvania	9.29	4.94	14.23
Rhode Island	6.44	4.19	10.63
South Carolina	5.37	2.81	8.18
South Dakota	3.62	0.84	4.46
Tennessee	8.35	2.51	10.86
Texas	5.30	2.58	7.88
Utah	12.12	4.27	16.39
Vermont	12.00	2.93	14.93
Virginia	7.61	4.64	12.25
Washington	8.97	3.67	12.64
West Virginia	8.40	2.40	10.80
Wisconsin	12.09	6.23	18.32
Wyoming	3.30	1.80	5.10
U.S. Average	9.55	4.56	14.11

Source: U.S. Department of Agriculture, Food and Nutrition Service, "Food Stamp Program Quality Control Annual Report, Fiscal Year 2001."

Notes:

U.S. average is weighted by state issuance and includes Guam and Virgin Islands.
Row entries may not sum to the indicated row total due to rounding.

Exhibit 19: Households With and Without Earnings, Caseload Shares by State, 1998-2001 Combined

State	Share of caseload (%)		Total
	Households with earnings	Households without earnings	
Alabama	29.8	70.2	100.0
Alaska	32.6	67.4	100.0
Arizona	32.9	67.1	100.0
Arkansas	28.5	71.5	100.0
California	30.5	69.5	100.0
Colorado	29.8	70.2	100.0
Connecticut	12.3	87.7	100.0
Delaware	27.4	72.6	100.0
District of Columbia	10.4	89.6	100.0
Florida	25.4	74.6	100.0
Georgia	28.7	71.3	100.0
Hawaii	27.0	73.0	100.0
Idaho	41.2	58.8	100.0
Illinois	27.2	72.8	100.0
Indiana	27.9	72.1	100.0
Iowa	32.1	67.9	100.0
Kansas	28.1	71.9	100.0
Kentucky	25.9	74.1	100.0
Louisiana	33.0	67.0	100.0
Maine	20.2	79.8	100.0
Maryland	21.6	78.4	100.0
Massachusetts	15.5	84.5	100.0
Michigan	31.2	68.8	100.0
Minnesota	22.0	78.0	100.0
Mississippi	28.8	71.2	100.0
Missouri	26.5	73.5	100.0
Montana	34.0	66.0	100.0
Nebraska	32.7	67.3	100.0
Nevada	21.1	78.9	100.0
New Hampshire	20.6	79.4	100.0

**Exhibit 19: Households With and Without Earnings, Caseload Shares by State, 1998-2001
Combined (Continued)**

State	Share of caseload (%)		Total
	Households with earnings	Households without earnings	
New Jersey	15.8	84.2	100.0
New Mexico	32.2	67.8	100.0
New York	16.7	83.3	100.0
North Carolina	27.2	72.8	100.0
North Dakota	40.8	59.2	100.0
Ohio	22.8	77.2	100.0
Oklahoma	29.3	70.7	100.0
Oregon	31.0	69.0	100.0
Pennsylvania	26.1	73.9	100.0
Rhode Island	19.6	80.4	100.0
South Carolina	29.1	70.9	100.0
South Dakota	38.6	61.4	100.0
Tennessee	25.5	74.5	100.0
Texas	38.3	61.7	100.0
Utah	34.9	65.1	100.0
Vermont	23.7	76.3	100.0
Virginia	28.7	71.3	100.0
Washington	22.2	77.8	100.0
West Virginia	24.1	75.9	100.0
Wisconsin	32.3	67.7	100.0
Wyoming	42.6	57.4	100.0
U.S. Average	26.8	73.2	100.0

Source: Food stamp QC data by state, pooled over the period 1998-2001.

Exhibit 20: Case Error Indicators by State, 1998-2001 Combined: Total Households

State	Total error rate	First-month error rate	Next-month error rate for:			
			Ongoing correct cases	Ongoing error cases	Expiring correct cases	Expiring error cases
Alabama	14.4	16.5	8.5	45.0	9.0	2.0
Alaska	22.4	18.1	20.9	13.9	30.5	0.0
Arizona	8.7	6.2	6.3	29.6	5.3	7.8
Arkansas	7.2	4.8	3.0	27.2	6.2	29.3
California	24.1	12.5	17.1	42.1	5.2	7.2
Colorado	13.2	8.5	5.8	46.7	9.0	29.0
Connecticut	16.7	13.7	6.8	62.3	8.6	31.4
Delaware	19.8	14.8	10.5	54.9	6.6	9.9
District of Columbia	16.6	9.0	9.3	50.1	12.8	7.4
Florida	13.7	11.0	8.7	47.4	5.7	3.3
Georgia	14.4	9.8	7.3	47.7	11.2	13.4
Hawaii	13.9	14.3	8.1	46.3	5.1	29.0
Idaho	12.2	10.3	5.9	48.3	9.8	19.0
Illinois	16.4	7.9	7.6	39.3	18.8	32.3
Indiana	10.2	9.2	4.2	43.3	8.3	14.5
Iowa	12.4	10.8	7.1	25.4	14.6	22.7
Kansas	14.2	12.3	8.5	41.6	8.9	31.2
Kentucky	10.2	8.1	5.5	45.3	6.7	5.2
Louisiana	12.2	11.3	5.7	60.5	5.4	5.6
Maine	13.4	16.4	6.3	47.6	13.7	25.8
Maryland	17.4	12.4	6.9	68.3	6.3	20.6
Massachusetts	12.5	11.5	6.5	47.5	9.6	14.1
Michigan	21.9	14.2	8.5	68.4	8.6	22.4
Minnesota	7.3	3.8	3.6	14.3	2.5	34.5
Mississippi	8.3	6.4	5.2	15.6	7.5	20.3
Missouri	11.9	7.8	5.8	50.5	10.6	14.8
Montana	13.5	8.7	7.6	23.0	9.8	9.2
Nebraska	18.3	15.4	10.6	40.5	13.2	29.4
Nevada	10.6	8.7	7.9	13.0	11.0	8.6
New Hampshire	16.1	13.6	8.6	57.8	6.5	9.6

**Exhibit 20: Case Error Indicators by State, 1998-2001 Combined: Total Households
(Continued)**

State	Total error rate	First-month error rate	Next-month error rate for:			
			Ongoing correct cases	Ongoing error cases	Expiring correct cases	Expiring error cases
New Jersey	15.9	8.3	5.5	76.0	6.6	13.0
New Mexico	15.9	14.5	9.7	51.5	5.2	5.8
New York	17.0	14.0	5.9	71.5	8.2	17.2
North Carolina	11.6	8.8	6.8	40.5	11.5	6.8
North Dakota	9.8	10.9	6.5	15.9	14.4	8.8
Ohio	11.3	9.9	4.9	54.3	7.9	17.5
Oklahoma	14.9	14.9	8.9	30.6	15.7	10.7
Oregon	14.4	16.6	8.8	18.2	13.2	5.7
Pennsylvania	14.3	7.9	6.8	56.1	7.0	37.0
Rhode Island	10.8	6.9	5.6	46.8	3.7	28.4
South Carolina	9.9	7.0	4.9	39.8	10.8	21.7
South Dakota	4.7	3.0	2.6	42.8	1.0	42.6
Tennessee	10.3	9.9	5.7	52.3	4.5	11.1
Texas	8.4	5.1	4.8	55.1	2.2	11.1
Utah	15.4	10.7	10.1	40.5	13.3	13.3
Vermont	14.5	13.1	6.6	60.8	5.2	0.0
Virginia	14.0	11.0	9.8	40.7	11.3	0.0
Washington	12.4	12.7	7.8	34.0	8.9	16.4
West Virginia	12.5	9.6	6.6	58.2	3.7	5.1
Wisconsin	15.5	15.0	9.2	45.8	10.0	10.0
Wyoming	6.3	6.7	3.9	34.5	2.9	8.1
U.S. Average	14.4	10.2	7.7	48.1	7.8	11.9
25th percentile	10.7	8.2	5.7	36.9	5.6	7.6
50th percentile	13.5	10.7	6.8	45.8	8.6	13.3
75th percentile	15.7	13.7	8.5	53.3	11.1	22.6

Note: Values less than or equal to the 25th percentile are shown in bold.

Exhibit 21: Case Error Indicators by State, 1998-2001 Combined: Households with Earnings

State	Total error rate	First-month error rate	Next-month error rate for:			
			Ongoing correct cases	Ongoing error cases	Expiring correct cases	Expiring error cases
Alabama	21.0	27.8	12.5	38.5	13.7	12.3
Alaska	33.9	18.6	42.0	8.3	42.3	0.0
Arizona	13.7	8.6	11.8	22.9	8.0	7.6
Arkansas	10.6	8.8	5.5	23.2	10.7	52.1
California	30.2	24.9	24.1	29.3	11.0	3.3
Colorado	22.2	11.1	14.5	38.6	15.5	13.8
Connecticut	33.9	34.0	22.6	38.3	41.0	20.2
Delaware	33.3	18.6	23.6	41.3	23.6	0.0
District of Columbia	42.2	20.9	30.7	42.6	42.1	13.5
Florida	26.4	16.6	22.9	37.1	12.9	2.2
Georgia	22.7	13.4	15.6	32.0	21.2	11.1
Hawaii	22.2	23.5	16.4	37.8	3.5	42.0
Idaho	18.2	14.3	10.1	44.5	13.4	8.2
Illinois	26.8	13.6	16.5	31.1	33.0	35.0
Indiana	16.2	14.9	8.8	41.4	11.8	10.1
Iowa	20.7	19.4	14.0	21.1	37.6	27.4
Kansas	22.5	19.1	18.0	28.0	11.0	40.5
Kentucky	16.7	11.3	12.3	38.9	9.4	3.9
Louisiana	19.1	15.7	12.6	56.3	7.0	4.0
Maine	20.3	21.9	14.2	25.2	20.7	15.7
Maryland	30.9	11.4	18.3	63.1	15.6	19.8
Massachusetts	23.8	20.5	20.5	26.0	13.3	12.4
Michigan	32.7	21.3	18.7	61.4	12.7	17.0
Minnesota	13.3	6.9	8.6	12.2	8.7	0.0
Mississippi	15.0	7.5	11.1	9.9	19.8	28.8
Missouri	18.7	11.2	11.5	40.2	16.8	15.0
Montana	25.3	25.7	17.1	29.3	26.4	0.0
Nebraska	31.6	16.7	22.3	44.4	22.7	27.8
Nevada	24.3	20.9	21.8	8.2	22.0	16.9
New Hampshire	28.4	22.8	20.8	51.4	13.6	4.0

Exhibit 21: Case Error Indicators by State, 1998-2001 Combined: Households with Earnings
(Continued)

State	Total error rate	First-month Error rate	Next-month error rate for:			
			Ongoing correct cases	Ongoing error cases	Expiring correct cases	Expiring error cases
New Jersey	31.1	9.0	14.2	74.6	15.9	7.9
New Mexico	19.7	19.4	14.5	40.2	6.2	5.5
New York	26.0	27.0	13.5	60.9	14.0	16.2
North Carolina	20.6	12.8	16.4	30.8	16.8	7.7
North Dakota	17.5	16.6	14.0	16.4	21.7	0.0
Ohio	19.2	13.4	14.0	37.7	12.2	21.0
Oklahoma	24.7	20.4	20.6	14.4	23.2	7.4
Oregon	22.7	23.6	17.1	16.1	25.6	4.9
Pennsylvania	25.2	8.5	17.1	44.5	22.6	34.0
Rhode Island	25.6	12.9	18.7	42.6	17.3	37.4
South Carolina	14.7	8.5	9.6	21.2	15.0	15.1
South Dakota	6.4	3.6	5.0	27.2	0.0	0.0
Tennessee	17.5	13.3	13.6	36.8	8.8	5.2
Texas	12.7	7.4	9.1	53.1	2.1	6.5
Utah	24.5	23.4	20.9	30.5	20.6	7.7
Vermont	28.0	29.4	17.1	53.7	11.2	0.0
Virginia	28.3	20.1	26.4	25.8	22.5	0.0
Washington	22.0	23.4	17.6	23.9	14.8	29.5
West Virginia	20.2	16.4	14.7	42.0	5.4	1.6
Wisconsin	23.4	23.4	16.5	38.9	14.1	9.1
Wyoming	9.6	12.0	7.0	33.2	2.6	9.5
U.S. Average	22.6	15.5	16.0	37.2	13.1	9.5
25th percentile	18.4	11.7	12.5	25.5	11.0	4.0
50th percentile	22.5	16.6	16.4	37.1	14.8	9.5
75th percentile	26.6	21.6	19.6	42.3	21.9	18.4

Note: Values less than or equal to the 25th percentile are shown in bold.

Exhibit 22: Case Error Indicators by State, 1998-2001 Combined: Households without Earnings

State	Total error rate	First-month error rate	Next-month error rate for:			
			Ongoing correct cases	Ongoing error cases	Expiring correct cases	Expiring error cases
Alabama	11.6	7.8	6.8	50.5	5.8	0.0
Alaska	16.8	17.8	12.6	19.4	25.4	0.0
Arizona	6.2	4.9	3.9	36.4	3.8	8.2
Arkansas	5.8	2.7	2.1	29.5	3.9	0.0
California	21.4	9.4	13.9	50.5	2.8	9.0
Colorado	9.4	7.0	2.7	45.8	4.4	44.9
Connecticut	14.3	9.0	4.9	70.2	2.7	36.8
Delaware	14.6	13.2	6.1	67.8	0.8	14.8
District of Columbia	13.7	7.6	7.2	52.4	9.6	4.0
Florida	9.3	8.3	4.7	55.9	2.7	5.2
Georgia	11.0	7.5	4.6	55.9	3.5	15.9
Hawaii	10.8	11.4	5.4	51.0	5.4	17.5
Idaho	8.1	5.9	3.3	54.4	6.2	37.3
Illinois	12.5	6.0	4.8	46.5	12.6	30.1
Indiana	7.8	5.2	2.7	42.2	6.0	19.5
Iowa	8.5	5.8	4.1	29.8	5.6	16.8
Kansas	11.0	8.2	5.2	52.5	7.4	24.2
Kentucky	8.0	6.1	3.5	46.9	4.8	8.5
Louisiana	8.8	8.5	3.0	63.8	4.1	10.3
Maine	11.6	13.6	4.7	56.9	9.6	33.0
Maryland	13.7	12.7	4.5	71.1	2.9	21.2
Massachusetts	10.4	8.5	4.5	55.4	8.0	15.4
Michigan	17.0	10.2	4.8	74.2	5.1	32.2
Minnesota	5.7	2.4	2.3	15.4	0.8	34.9
Mississippi	5.6	5.9	3.0	25.7	2.9	22.5
Missouri	9.4	5.6	4.2	49.3	5.9	14.5
Montana	7.4	1.0	3.6	17.9	4.0	8.7
Nebraska	11.9	14.7	6.2	33.2	7.3	25.7
Nevada	6.9	3.2	5.1	17.4	7.5	0.0
New Hampshire	12.9	10.5	5.9	59.8	4.7	14.8

Exhibit 22: Case Error Indicators by State, 1998-2001 Combined: Households without Earnings
(Continued)

State	Total error rate	First-month error rate	Next-month error rate for:			
			Ongoing correct cases	Ongoing error cases	Expiring correct cases	Expiring error cases
New Jersey	13.0	8.2	4.1	76.8	4.9	16.0
New Mexico	14.1	11.7	7.7	58.0	4.4	6.0
New York	15.2	10.0	4.6	74.7	6.9	17.8
North Carolina	8.3	6.2	4.0	48.1	7.6	5.6
North Dakota	4.6	6.0	2.0	15.2	6.8	24.2
Ohio	9.0	8.0	2.9	54.5	5.1	10.8
Oklahoma	10.8	10.4	5.3	42.0	8.7	19.2
Oregon	10.7	13.3	5.6	19.6	5.6	7.9
Pennsylvania	10.5	7.7	3.7	63.5	3.4	40.7
Rhode Island	7.2	5.1	2.8	47.8	2.0	22.8
South Carolina	7.9	6.4	3.1	54.3	6.8	25.4
South Dakota	3.6	2.6	1.0	61.9	1.4	77.4
Tennessee	7.8	7.6	3.5	61.4	1.9	19.3
Texas	5.7	3.5	2.5	50.1	2.3	19.6
Utah	10.5	3.0	5.6	52.3	7.7	22.5
Vermont	10.3	6.9	3.8	66.4	3.8	0.0
Virginia	8.3	6.6	4.0	58.2	3.2	0.0
Washington	9.6	8.3	5.5	40.8	7.3	9.6
West Virginia	10.1	5.6	4.2	66.4	2.5	9.5
Wisconsin	11.7	9.3	6.3	52.1	7.3	11.1
Wyoming	3.8	3.4	1.9	36.6	3.3	0.0
U.S. Average	11.5	7.6	5.0	54.5	4.9	14.3
25 th percentile	7.9	5.7	3.2	41.4	3.2	8.4
50 th percentile	10.1	7.6	4.2	52.1	4.9	15.9
75 th percentile	11.8	9.4	5.3	59.0	7.1	23.5

Note: Values less than or equal to the 25th percentile are shown in bold.

Differences Among States in Their Underlying Error Patterns

Total household findings, shown in Exhibit 20, are:

- Some states achieve low total case error rates through strong performance in initial certification, interim action, and recertification. Arizona, Kentucky, and Wyoming, as examples, are in the lowest-quartile for their total error rate and are below the median in all five of the component error parameters.
- Other states have low overall rates and show strong performance on some but not all phases of certification, indicating the potential for further improvement. Minnesota and South Carolina, for instance, have total error rates in the lowest quartile despite having recertification procedures that appear not as effective as most other states in preventing and correcting errors. In contrast, Oklahoma and Oregon do reasonably well in containing errors at interim action and recertification, but each has a high error rate at initial certification.

A contrasting pattern of error is evident among households with earnings, as shown in Exhibit 21.

- The following states are in the lowest quartile for the total error rate and are below the median in all five component parameters, for households with earnings: Arizona, Minnesota, South Dakota, Tennessee, and Wyoming.
- A number of other states have low total error rates for households with earnings, but with potential for improvement on some phases of case action. For example, Idaho, Indiana, and Texas are in the lowest quartile for the total error rate, despite having a high next-month error rate for ongoing error cases. This suggests that their interim action procedures are not effective in detecting and correcting errors. Mississippi and South Carolina, in contrast, do very well at avoiding errors at initial certification and interim action, but could improve the accuracy of their recertification decisions.

In possible future research, it would be instructive to consider the error patterns by state—especially for households with earnings—in the context of the client reporting provisions that states have adopted for such households. These reporting provisions are presumed to influence especially the “client error” component of the error rate—i.e., the extent to which error is attributable to a household not having correctly or completely reported information that it was required to report, such as a change in income or other financial circumstances. Throughout this report, the error measures include both client error and agency error.

Chapter Six: Effects of More Frequent Recertification

Short certification periods are frequently used to control error, especially among cases with earnings. Such periods may unintentionally reduce program participation.

Using the Model to Test Alternative Scenarios

One can use the derived transition matrix for each year to examine the effects of alternative scenarios regarding more frequent recertification. In doing so, we make use of the formulas provided at the end of Chapter Three for the projected long-term aggregate participation rate and case error rate. To recall, the steady-state distribution expresses the eventual outcome that would be obtained if the pattern of monthly transitions, as estimated for a given “base year,” were continued uninterrupted. As explained in this chapter, changes in the frequency of recertification can be evaluated in terms of the shift in the long-term distribution of households according to their participation and error status.

The alternative scenario examined here is one that increases by 5 percentage points the “recertification rate” for cases with earnings. *We define the recertification rate as the percentage of current-month active cases that are expiring cases (i.e., cases in the final month of their certification period).* For these cases, their next-month status will be a result of the recertification process. The remaining balance of current-month active cases consists of ongoing cases, whose next-month status will be subject to the interim action process.

In the terms of the basic transition matrix (Exhibit 6), the recertification rate is measured as the share of the current-month caseload comprised by expiring correct cases (the fourth-row total) and expiring error cases (the fifth-row total), as follows:

$$\text{Recertification rate} = (R_4 + R_5)/(R_2 + R_3 + R_4 + R_5)$$

One can carry this logic further to specify the recertification rate separately for current-month correct cases as $R_4/(R_2+R_4)$ and for current-month error cases as $R_5/(R_3+R_5)$.

Note that the recertification rate will approximately equal the inverse of the average length of certification period. For cases with earnings, whose average certification length is about 7 months (as shown in Exhibit A-2), the recertification rate will thus be about 1/7 or 14.3 percent. An increase of 5 percentage points in the recertification rate, to 19.3 percent, corresponds to a reduction in the average certification length from 7 months to about 5.2 months (1/0.193).

In understanding how the model is used to test such an alternative scenario, it is useful to regard the five-group model as reducible to a three-group equivalent (as shown in Exhibit 4 of Chapter Two), whose groups consist of nonparticipating households, correct cases, and error cases. The transition probabilities for correct cases (the second-row entries of the three-group transition matrix) can be viewed as weighted averages of the probabilities specific to ongoing correct cases (i.e., those subject to interim action) and expiring correct cases (i.e., those subject to recertification). The weights reflect the recertification rates for correct cases. A similar logic applies to the transition probabilities for error cases (the third-row entries of the three-group matrix).

In using the model to simulate an assumed increase in the recertification rate, one allows the next-month status of current-month cases to reflect more heavily the transition probabilities specific to recertifications. Thus, the probabilities specific to interim actions are reflected less heavily. The model does this separately for current-month correct cases and current-month error cases. Specifically, we assume that the increase of 5 percentage points in the overall recertification rate occurs through a 5-percentage-point increase in the recertification rate for both current-month correct cases and current-month error cases.

To explain further, the “alternative scenario” is simulated by modifying the transition matrix for the “base scenario” in the following manner. We first convert the 5-by-5 matrix of cell counts (previously estimated for the chosen base year) into an equivalent 3-by-3 matrix of cell counts. This reconfigured matrix maintains nonparticipating households as one group and establishes participating correct cases and participating error cases as the other two groups. (Thus, the distinction between correct cases and error cases is maintained in the new matrix, but the explicit distinction between ongoing cases and expiring cases is removed.) The higher recertification rate under the alternative scenario can then be translated into a recomputed set of transition probabilities along the newly defined second row (current-month correct cases) and the newly defined third row (current-month error cases). Within each of these rows, the modified pattern of next-month outcomes under the alternative scenario can be represented through a re-weighting of the component transition probabilities specific to ongoing cases and expiring cases. In each row, the assumed 5-percentage-point increase in the recertification rate implies a reduction in the weights specific to ongoing cases and a corresponding increase in the weights specific to expiring cases.

The alternative scenario is assumed to have no effect on the rate of case openings and the accuracy of initial certifications (i.e., the first-row matrix entries). The alternative scenario is also assumed to cause no behavioral response among cases during interim months. For example, the simulation assumes no change in the likelihood that an ongoing error case voluntarily withdraws from the program.

Having recalculated the transition matrix through such a re-weighting, one can then apply the formulas shown at the end of Chapter Three to re-compute the long-term values for the

aggregate participation rate and the case error rate. (The formulas, developed in the context of a 5-by-5 matrix, are also applicable to the reconfigured 3-by-3 framework described above.) The effect of the alternative scenario is assessed by comparing these long-term values with those corresponding to the base scenario.

Note that such a shift could either increase or decrease the case error rate, depending on whether the reduction in error cases (the numerator of the case error rate) falls short of or exceeds the reduction in active cases (the denominator). Although in principle the effect on the aggregate participation rate (and thus on the size of the caseload) could also be either upward or downward, one expects a downward change. The reason is that a case termination is more likely when a case is subject to a recertification than when it is subject to the interim action process. If recertifications occur more frequently, the higher resulting rate of monthly case closure (along with an unchanged case opening rate) will expectedly reduce the aggregate participation rate.

To see whether the results are sensitive to the particular base year, we tested the alternative scenario using both 2000 and 2001 as base years.

Findings

Exhibit 23 shows the estimated long-term effect on participation and error for cases with earnings of the assumed 5 percentage point increase in the recertification rate for such cases. Using 2000 as the base year, the alternative scenario implies an increase in the recertification rate from 15.50 to 20.50 percent, roughly equivalent to a reduction in the average certification length from 6.5 to 4.9 months. With 2001 as the base year, the implied increase in the recertification rate is from 13.53 to 18.53 percent.

Under both sets of estimates, the results are consistent with respect to the direction of change in the components of the aggregate participation rate and the aggregate error rate, both of which are expressed in terms of the total population of households with earnings.

- ***Aggregate participation rate:*** Under both sets of estimates, the alternative scenario was found to increase the case closure rate (b). In conjunction with an unchanged case opening rate (a), this leads to a lower aggregate participation rate ($a/(a+b)$). In proportional terms, the estimated effect on the eventual size of the caseload for earnings cases is a 6.5 percent reduction for the 2000-based estimates, versus only a 0.7 percent reduction for the 2001-based estimates. The difference appears attributable to the lower rate of case closure for expiring correct cases in the 2001 matrix (4.9 percent) that in the 2000 matrix (15.4 percent), as shown in Exhibits C-7 and C-8.

Exhibit 23: Estimated Effects of More Frequent Recertification, Households with Earnings

		Long-term outcome		Absolute change	Proportional change
		Base scenario	Alternative scenario		
Households with earnings: base year 2000					
Recertification rate (%)		15.50	20.50	5.00	
Case opening rate (%)	a	0.24	0.24		
Case closure rate (%)	b	10.29	11.02		
Aggregate participation rate (%)	$p^* = a/(a+b)$	2.31	2.16	-0.15	-6.5%
Error opening rate (%)	c	0.33	0.33		
Error closure rate (%)	d	64.97	66.54		
Aggregate error rate (%)	$e^* = c/(c+d)$	0.51	0.49	-0.02	-3.3%
Case error rate (%)	$r^* = e^*/p^*$	21.92	22.68	0.76	3.5%
Households with earnings: base year 2001					
Recertification rate (%)		13.53	18.53	5.00	
Case opening rate (%)	a	0.26	0.26		
Case closure rate (%)	b	11.02	11.09		
Aggregate participation rate (%)	$p^* = a/(a+b)$	2.33	2.32	-0.02	-0.7%
Error opening rate (%)	c	0.30	0.30		
Error closure rate (%)	d	65.81	67.36		
Aggregate error rate (%)	$e^* = c/(c+d)$	0.45	0.44	-0.01	-1.7%
Case error rate (%)	$r^* = e^*/p^*$	19.19	18.99	-0.20	-1.0%

Note: All outcomes pertain to households with earnings. See Chapter Three for the formulas used to compute each long-term outcome measure.

- Aggregate error rate:** Under both sets of estimates, the alternative scenario was found to increase the error closure rate (d), with no change in the error opening rate (c). This implies a lower aggregate error rate ($c/(c+d)$). Stated otherwise, the alternative scenario leads to a very slight long-term reduction in the average monthly number of error cases among households with earnings. The projected

reduction is more pronounced in the 2000-based estimates (3.3 percent) than in the 2001-based estimates (1.7 percent).

- **Case error rate:** The effect on the case error rate will depend on whether the effect on the aggregate error rate is proportionally greater than or less than the effect on the aggregate participation rate. Here, the two sets of estimates differ. The 2000-based estimates imply an *increase* in the case error rate, as the estimated reduction in participation (6.5 percent) is greater proportionally than the reduction in error (3.3 percent). In contrast, the 2001-based estimates show a *decrease* in the case error rate, as the estimated drop in participation (0.7 percent) is smaller than the reduction in error (1.7 percent).

These findings suggest that the long-term effects of more frequent recertification for earnings cases will be to reduce both the monthly number of participating households and the monthly number of error cases among households with earnings. The effect will be to reduce the case error rate (the percentage of participating cases in error) only if the proportional reduction in error cases exceeds the reduction in participating households. This relationship was found in the 2000-based estimates but not in the 2001-based estimates.

The findings should be interpreted with some caution, however, as they are based on assumptions about the recertification process. These assumptions, as noted earlier, are necessitated by the limitations of the QC data in providing retrospective detail on the status of correct cases. Specifically (with respect to cell Q₅₂ in Exhibit 6), the model assumes that among cases currently in error, the percentage that emerge the following month as correctly paid active cases is the same for those subject to recertification as for those subject to interim action. Under this assumption, the effect of more frequent recertification on the error rate occurs through the higher closure of error cases at recertification. Such case closures reduce both the numerator and denominator of the case error rate, thus moderating the change in the measured case error rate.

Another key modeling assumption (pertaining to cells Q₃₂ and Q₃₄ in Exhibit 6) is that ongoing or expiring cases that are correct in one month were in error the prior month only if an interim change has just occurred. The interim change is thus assumed to have corrected an error.

Estimates based on the matrix for 2000 show a participation effect for cases with earnings similar to that found in the earlier-mentioned studies by Kabbani-Wilde and Kornfeld. These previous studies estimated the effect of an increase of 10 percentage points in the proportion of earnings cases subject to a short certification period. The alternative scenarios tested here represent upward shifts twice as large, increases of 18 to 22 percentage points in the

proportion of earnings cases with a short certification period.²⁴ Scaling back the 2000-based finding here by a factor of 2, the estimated caseload reduction amounts to 3.2 percent (6.5 percent divided by 2). This compares to the 2.6 percent caseload decline estimated by Kabbani-Wilde (for cases with earnings) and the 2.3 to 2.4 percent caseload decline estimated by Kornfeld (for cases consisting of multiple adults with children or cases with adults only). The estimated proportional decrease in participation is much smaller here (0.3 percent) if one instead uses 2001 as the base year.

In contrast, the model-estimated effect on the error rate for cases with earnings is negligible compared to the effect found in the Kabbani-Wilde study. The findings here, again scaled back to reflect an increase of 10 percentage points in the proportion of earnings cases subject to a short certification period, range from an error rate increase of 0.4 percentage points for the 2000-based estimate to an error rate decrease of 0.1 percentage point for the 2001-based estimate. The corresponding effect on the *dollar* error rate would be even smaller, as dollar error rates are consistently smaller than case error rates.²⁵ The Kabbani-Wilde study found a reduction of 0.8 percentage points in the dollar error rate for earnings cases.

As to why the model developed here yields a smaller effect on error than found by Kabbani-Wilde, one can only speculate. One possible explanation is that, although the Kabbani-Wilde estimating equation included many covariates (plus state-specific and year-specific fixed effects), the estimated coefficient on the short-certification variable may have captured the influence of other excluded variables that are correlated with the use of more frequent recertification. One indication of this is that, in the Kabbani-Wilde error rate equation for households *without* earnings, the short-certification variable was again strongly significant, although somewhat smaller than for earnings cases.

In comparison to the more conventional multivariate econometric approaches used by Kabbani-Wilde and Kornfeld, one seeming advantage of the model developed here is that it constitutes a more direct operational representation of the administrative processes and

²⁴ Using 2000 as the base year, the increase of 5 percentage points in the recertification rate for earnings cases (from 15.5 to 20.5 percent) is roughly equivalent to a 1.6-month reduction in the average certification length, from 6.5 months (1/0.155) to 4.9 months (1/0.205). It is reasonable to assume that any increase in the proportion of earnings cases subject to a short certification period is achieved by shortening to 3 months the certification period of those with annual recertification. For every additional 10 percent of earnings cases assigned to a 3-month certification, the reduction in the average certification length is thus 0.9 months. To achieve a reduction of 1.6 months in the average certification length, the implied increase in the proportion of earnings cases subject to a short certification period would be 18 percentage points (1.6/0.9). Using 2001 as the base year, the corresponding estimate is 22 percentage points. These estimates, ranging from 18 to 22 percent, are approximately twice as large as the 10 percent assumed in the Kabbani-Wilde and Kornfeld studies.

²⁵ The dollar error rate is the product of the case error rate and the following ratio: the average error amount divided by the average payment amount. Because the latter ratio is typically less than one, the dollar error rate is typically less than the case error rate.

events that underlie food stamp error and participation. The simplifying assumptions of the model, as necessary to overcome the limitations of QC data, can be explicitly considered and tested. Indeed, the issues raised in this exploratory research suggest that the modeling assumptions should be further scrutinized before undertaking any future applications of the model.

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Appendix A
Distribution of Food Stamp Households by
Length of Certification Period

Exhibit A-1: Distribution of food stamp households by length of certification period, 1997-2001: all households

Length of certification period	1997	1998	1999	2000	2001
Percentage distribution, all households (%)					
Number of months					
1	0.5	0.5	0.5	0.5	0.4
2	0.8	0.9	1.1	1.1	0.9
3	10.8	13.6	15.3	16.9	15.9
4	3.2	3.4	3.8	4.5	4.3
5	1.9	2.0	2.1	1.9	1.8
6	17.0	14.5	13.8	12.7	14.2
7	2.3	2.3	2.3	2.1	2.2
8	0.8	0.8	0.7	0.7	0.7
9	0.7	0.6	0.5	0.6	0.5
10	0.9	0.9	0.8	0.6	0.5
11	2.1	1.9	1.9	1.7	1.6
12	49.2	49.4	48.7	47.8	48.2
13+	9.3	9.0	8.2	8.4	8.3
Unknown	0.5	0.2	0.4	0.4	0.3
Total	100.0	100.0	100.0	100.0	100.0
Estimated value, all households (months)					
Mean	9.9	9.9	9.7	9.6	9.7
Standard error	0.03	0.05	0.03	0.03	0.03

Source: U.S. Department of Agriculture, Food and Nutrition Service, "Characteristics of Food Stamp Households," fiscal years 1997-2001.

Exhibit A-2: Distribution of food stamp households by length of certification period, 1997-2001: households with earnings

Length of certification period	1997	1998	1999	2000	2001
Percentage distribution, households with earnings (%)					
Number of months					
1	0.4	0.5	0.5	0.5	0.4
2	1.1	1.2	1.6	1.9	1.2
3	24.3	28.8	30.9	34.3	31.4
4	4.5	5.8	6.4	7.2	7.2
5	2.1	2.3	2.6	2.3	2.1
6	19.0	13.8	14.8	13.3	15.4
7	2.1	2.6	2.4	2.2	2.6
8	0.9	0.8	0.6	0.7	0.8
9	0.8	0.5	0.5	0.5	0.5
10	0.6	0.7	0.6	0.4	0.5
11	1.4	1.4	1.1	1.0	0.8
12	36.2	36.7	34.7	32.9	33.9
13+	6.3	4.8	3.1	2.8	2.9
Unknown	0.4	0.1	0.1	0.2	0.1
Total	100.0	100.0	100.0	100.0	100.0
Estimated value, households with earnings (months)					
Mean	8.1	7.8	7.5	7.2	7.3
Standard error	0.08	0.06	0.06	0.06	0.06

Source: U.S. Department of Agriculture, Food and Nutrition Service, "Characteristics of Food Stamp Households," fiscal years 1997-2001.

Exhibit A-3: Distribution of food stamp households by length of certification period, 1997-2001: households without earnings

Length of certification period	1997	1998	1999	2000	2001
Percentage distribution, households without earnings (%)					
Number of months					
1	0.5	0.5	0.5	0.5	0.4
2	0.8	0.7	0.9	0.9	0.8
3	6.5	8.2	9.6	10.4	10.2
4	2.8	2.5	2.9	3.5	3.3
5	1.9	2.0	1.9	1.8	1.7
6	16.4	14.7	13.4	12.5	13.7
7	2.4	2.2	2.2	2.1	2.0
8	0.7	0.8	0.7	0.7	0.7
9	0.7	0.6	0.5	0.6	0.5
10	1.0	1.0	0.9	0.7	0.6
11	2.4	2.1	2.2	2.0	1.9
12	53.3	53.8	53.8	53.3	53.5
13+	10.2	10.5	10.0	10.6	10.3
Unknown	0.5	0.3	0.5	0.5	0.4
Total	100.0	100.0	100.0	100.0	100.0

Source: U.S. Department of Agriculture, Food and Nutrition Service, "Characteristics of Food Stamp Households," fiscal years 1997-2001.

Appendix B

Procedures For Deriving The Transition Matrix

This appendix explains the derivation of the cell counts for each column of the transition matrix. The notation here is as shown in Exhibit 6 of the report.

Variables Used from Food Stamp Quality Control Data

The model makes use of the following variables for each sample case in the food stamp QC database:

- STATUS: case error finding for review month
 - 1 amount correct
 - 2 overissuance (\$25 or more)
 - 3 underissuance (\$25 or more)
 - 4 ineligible

- ACTNTYPE: action type, for most recent action
 - 1 initial certification
 - 3 recertification
 - 5 interim change

- CERTMTH: length of assigned certification period, in months

- LASTCERT: number of months since last formal certification for food stamps (initial certification or recertification).

- RCNTACTN: date (year, month, and day) of the most recent action (either initial certification, recertification, or interim change)

- OCCDATE: date (year and month) of error occurrence (for error cases)¹

- YRMONTH: date (year and month) for which the case has been sampled and reviewed (review month)

- FSEARN: monthly household earnings, as indicated in the case record (sum of wages and salaries, self-employment income, and other earned income).

It is important to note several limitations of the QC data, which require the creation of additional variables or the use of assumptions in estimating the model:

¹ This variable is drawn from the “detailed error findings” recorded on the Quality Control Review Schedule, and is available only in the backup files made available for this analysis. The date of occurrence is recorded for up to nine errors that may have been discovered during the QC review.

- For cases in which the most recent action is an interim change, the variable LASTCERT indicates the number of months since the most recent *formal certification* (initial certification or recertification). Because of the need to establish the time elapsed since the most recent *action* (initial certification, interim change, or recertification) for all cases, an additional variable, LASTACT, is computed. This is the number of months since the most recent action, computed as the difference between RCNTACTN and YRMONTH. LASTACT thus differs from LASTCERT for those cases whose most recent action was an interim change.
- For active cases found in error at the QC review, the indicated timing of error occurrence is used to establish whether the case was correct or in error during the preceding month. An error case is considered to have been correct in the preceding month if the occurrence dates for all indicated errors are within two months of the review month. Conversely, an error case is considered to have been in error in the preceding month if the occurrence date for any of its indicated errors is more than two months before the review month.²
- For cases that are correct at the QC review, there is no indication in the QC record of the presence of error in any previous month. As indicated below, ***we assume that an ongoing correct case was also correct in the preceding month, unless the case has just undergone an interim change.*** The interim change is assumed to have occurred because the case was in error and required a benefit adjustment.³

The following sections of this appendix explain the derivation of the cell counts for each column of the matrix, beginning with the right-most of the five columns and then working to the left, using the notation in Exhibit 6 of this report. Using the definitions described below, and as shown in Exhibits B-1 through B-5, all cases in the QC sample are assigned to one (and only one) cell in columns two through five. Then, as described in the final section below, the cells in the first column entries are computed as row residuals.

² We also tested the model under alternative assumptions regarding this time window. It appears that reviewers may use the occurrence date to indicate the date of the underlying change in household circumstances that precipitated the error, rather than the date of onset of the QC error itself. Once a change in circumstances occurs, there is an allowable time interval for the client to report the change and a further time interval for the agency to act on the reported change.

³ This assumption may overstate the number of cases previously in error, to the extent that: (a) an interim change may serve to prevent an error from arising, through timely benefit adjustment; or (b) an interim change may be recorded even though the caseworker simply processed a monthly or quarterly report without a change in benefit. However, the assumption may also understate the number of cases previously in error, by not taking account of “transient” errors that “self-correct”—i.e., errors associated with unreported short-term changes in household circumstances, such as temporary increases in income. Such cases “self-correct” (without an interim change) when the household’s circumstances return to the *status quo ante*.

In this appendix, we refer to month-to-month transitions that occur between the QC review month and the prior month. In the body of the report, for ease of exposition, we adopt a different terminology, referring to transitions between the current month and the next month. We find it helpful to consider these transitions as occurring from March to April. Under this nomenclature, the review month is the next month, and the month preceding the review is the current month.

Expiring Error Cases

The fifth column of the transition matrix (shown in Exhibit 6) is comprised of error cases that are at the end of their certification period in the review month. By definition, such cases are already in error as they enter recertification. The column total (C_5) is the count of all cases that are in error (STATUS=2, 3, or 4) and whose certification is about to expire or has expired (LASTCERT \$CERTMTH-1).⁴ This includes, for example, error cases assigned a 12-month certification period and for whom 11 or more months have elapsed since their most recent certification.⁵ Throughout this analysis, we use the word “expiring” to indicate that the case’s certification period is about to end, not that the case is itself about to terminate. As noted above, these cases are ones about to undergo recertification; their error has preceded the recertification action.

We determine the prior-month status of each case in the fifth column, and thus determine its placement in one of the five cells in the fifth column, as follows (and as shown in Exhibit B-1):

⁴ We tested alternative specifications of this relationship. The one shown above was found to provide the most plausible results, based on information known about the length of assigned certification periods. If the mean length of certification period is n , the number of cases subject to recertification in any given month should be approximately $1/n$. One alternative tested and rejected was to consider a case to be expiring if LASTCERT \$CERTMTH. Under this definition the share of total cases classified as “expiring” each month was less than 0.100. This proportion was implausibly low, given that the mean certification length is between 9.5 and 10.0. The need to calibrate the model under alternative specifications arose from the fact that the QC review schedule records only the month and year (but not the day) of key events in a case’s history.

⁵ The model will tend to understate somewhat the number of cases that are due or overdue for recertification, for the following reason. In entering the variable LASTCERT, QC reviewers are instructed that “For households that are participating in months for which they have not been certified, enter the number of months beyond the end of the household’s certification period.” For instance, if a case did not undergo its scheduled recertification at the 12th month and is now participating at the 15th month, LASTCERT should be coded as 3, not 15. It is apparent, however, that not all reviewers follow this instruction, as there are cases for which LASTCERT exceeds CERTMTH.

Exhibit B-1: Derivation of Fifth-Column Cell Counts: Expiring Error Cases

Cell Count	Prior-month (“March”) status	Review-month (“April”) status	Criteria (based on variables from QC review, as defined in text)
Q ₁₅	Nonparticipating	Expiring error	equals 0, by assumption; see text
Q ₂₅	Ongoing correct	Expiring error	certification expiring (LASTCERT\$CERTMTH-1) and error in review month (STATUS=2, 3, or 4) and correct in prior month (OCCDATE\$YRMONTH-2)
Q ₃₅	Ongoing error	Expiring error	certification expiring (LASTCERT\$CERTMTH-1) and error in review month (STATUS=2, 3, or 4) and correct in prior month (OCCDATE<YRMONTH-2)
Q ₄₅	Expiring correct	Expiring error	equals 0, by assumption; see text
Q ₅₅	Expiring error	Expiring error	equals 0, by assumption; see text

- ***nonparticipating*** in prior month—The Q₁₅ cell count is 0 by definition, as the model assumes that one-month certification periods are negligible, implying that a nonparticipant would never in the next month be an active case at the end of its certification period.
- ***ongoing correct*** in prior month—The Q₂₅ cell consists of expiring cases for whom an error has just occurred, as indicated by an interval of two months or less between the error occurrence month and the review month (YRMONTH-OCCDATE # 2) for the earliest indicated error in the case.⁶
- ***ongoing error*** in prior month—The Q₃₅ cell consists of expiring error cases that were previously in error, as indicated by an interval of more than two months between the error occurrence month and the review month (YRMONTH-OCCDATE >2) for the earliest indicated error in the case.
- ***expiring correct*** in prior month—The Q₄₅ cell count is 0 by definition, as we assume that cases at the end of their certification period in the review month could not also have been expiring in the prior month.
- ***expiring error*** in prior month—For the same reason cited above, the Q₅₅ cell count is also 0 by definition.

Expiring Correct Cases

The fourth column of the matrix consists of correct cases that in the review month are at the end of their certification period. The column total (C₄) is the count of all expiring correct cases: cases that are both correctly paid (STATUS=1) and whose certification is about to expire or has expired (LASTCERT \$ CERTMTH-1).

We determine the prior-month status of each case, and thus its contribution to the cell counts in the fourth column, as follows (and as shown in Exhibit B-2):

- ***nonparticipating*** in prior month—The Q₁₄ cell count is 0 by definition (as with Q₁₅), for we assume no one-month certification periods. A case thus cannot be nonparticipating in one month and an expiring active case in the next month.

⁶ Here, once again, we tested and rejected alternative specifications, including YRMONTH-OCCDATE#1. The latter definition was found to assign an implausibly large number of cases to Q₃₅ and Q₅₅, resulting in large negative entries for the Q₃₁ and Q₅₁. The specification adopted here appears consistent with the QC rules that call upon reviewers to disregard errors (or “exclude variances”) associated with changes in client circumstances that occur in the month immediately prior to the review month.

Exhibit B-2: Derivation of Fourth-Column Cell Counts: Expiring Correct Cases

Cell Count	Prior-month (“March”) status	Review-month (“April”) status	Criteria (based on variables from QC review, as defined in text)
Q ₁₄	Nonparticipating	Expiring correct	equals 0, by assumption; see text
Q ₂₄	Ongoing correct	Expiring correct	certification expiring (LASTCERT\$CERTMTH-1) and correct in review month (STATUS=1)
Q ₃₄	Ongoing error	Expiring correct	certification expiring (LASTCERT\$CERTMTH-1) and correct in review month (STATUS=1) and interim action in review month (ACTNTYPE=5 and LASTACT=0)
Q ₄₄	Expiring correct	Expiring correct	equals 0, by assumption; see text
Q ₅₄	Expiring error	Expiring correct	equals 0, by assumption; see text

- **ongoing correct** in prior month—The Q₂₄ cell consists of expiring correct cases which were also correct in the prior month, as indicated by the absence of any recent interim change (ACTNTYPE = 1 or 3, or ACTNTYPE = 5 and LASTACT > 0). Under the model’s assumptions, the only circumstance in which an expiring correct case is regarded as having been in error in the prior month is if the case has just undergone an interim change, as accounted for below in cell Q₃₄.
- **ongoing error** in prior month—The Q₃₄ cell consists of expiring correct cases for whom an error has just been corrected, as indicated by a recent interim change (ACTNTYPE = 5 and LASTACT = 0).
- **expiring correct** in prior month—The Q₄₄ cell count is 0 by definition (as with Q₄₅ earlier), assuming that cases reaching the end of their certification period in the review month could not also have been an expiring case in the preceding month.
- **expiring error** in prior month—For the same reason cited above, the Q₅₄ cell count is also 0 by definition.

The assumption regarding cell Q₃₄ deserves further explanation. In deriving this cell count, we assume that the only scenario in which an ongoing or expiring correct case would have been in error the previous month is the situation in which the case has just undergone an interim action. We assume no self-correction of errors—i.e., no situations in which a case in error one month becomes correct the following month, in the absence of agency action. There are some “transient error” situations, however, in which self-correction might occur in the absence of an interim change. Consider, for instance, a case that is overpaid because of unreported income from a particular source. If the income from that source later returns to zero, the case becomes correct. Conversely, however, there will be some instances in which an interim change has occurred, but where the case has remained correctly paid throughout. For instance, if the interim change were to adjust the benefit by less than \$25 for an eligible case, there would have been no previous error, because of the \$25 error tolerance. Also, if the interim change was in response to a client’s timely report of a change in household circumstances, an error would have been prevented, but the case would not have actually been in error in the prior month.

In the text of this report, we have tested alternative specifications and examined the sensitivity of the model’s findings to this assumption.

Ongoing Error Cases

The third column consists of error cases that in the review month are not at the end of their certification period. The column total (C₃) is the count of all cases that are in error in the

review month (STATUS=2, 3, or 4) and whose certification has not expired (LASTCERT < CERTMTH-1). This includes, for example, error cases assigned a 12-month certification period and for whom less than 11 months have passed since their last certification.

We determine the prior-month status of each case, and thus its placement in the cells of the third column, as follows (and as shown in Exhibit B-3):

- ***nonparticipating*** in prior month—The Q₁₃ cell consists of households that have just been initially certified, as indicated by an initial certification that coincides with the review month (ACTNTYPE = 1 and LASTCERT=0).
- ***ongoing correct*** in prior month—The Q₂₃ cell consists of ongoing cases whose error has just occurred, as indicated by an interval of two months or less between the error occurrence month and the review month (YRMONTH-OCCDATE # 2) for the earliest indicated error in the case.
- ***ongoing error*** in prior month—The Q₃₃ cell consists of ongoing cases for whom the error has not just occurred, as indicated by an interval of more than two months between the error occurrence month and the review month (YRMONTH-OCCDATE >2) for the earliest indicated error in the case.
- ***expiring correct*** in prior month—The Q₄₃ cell consists of cases that have just been recertified (ACTNTYPE = 3 and LASTCERT = 0) and whose error has just occurred, as indicated by an interval of two months or less between the error occurrence month and the review month (YRMONTH-OCCDATE # 2) for the earliest indicated error in the case.
- ***expiring error*** in prior month—The Q₅₃ cell consists of cases that have just been recertified (ACTNTYPE = 3 and LASTCERT = 0) and whose error has not just occurred, as indicated by an interval of more than two months between the error occurrence month and the review month (YRMONTH-OCCDATE > 2) for the earliest indicated error in the case.

Exhibit B-3: Derivation of Third-Column Cell Counts: Ongoing Error Cases

Cell Count	Prior-month (“March”) status	Review-month (“April”) status	Criteria (based on variables from QC review, as defined in text)
Q ₁₃	Nonparticipating	Ongoing error	initial certification in review month (ACTNTYPE=1 and LASTCERT=0) and error in review month (STATUS=2, 3, or 4)
Q ₂₃	Ongoing correct	Ongoing error	certification not expiring (LASTCERT<CERTMTH-1) and error in review month (STATUS=2, 3, or 4) and correct in prior month (OCCDATE\$YRMONTH-2)
Q ₃₃	Ongoing error	Ongoing error	certification not expiring (LASTCERT<CERTMTH-1) and error in review month (STATUS=2, 3, or 4) and error in prior month (OCCDATE<YRMONTH-2)
Q ₄₃	Expiring correct	Ongoing error	error in review month (STATUS=2, 3, or 4) recertification in review month (ACTNTYPE=3 and LASTCERT=0) correct in prior month (OCCDATE\$YRMONTH-2)
Q ₅₃	Expiring error	Ongoing error	error in review month (STATUS=2, 3, or 4) recertification in review month (ACTNTYPE=3 and LASTCERT=0) error in prior month (OCCDATE<YRMONTH-2)

Ongoing Correct Cases

The second column of the matrix consists of correct cases that are not at the end of their certification period in the review month. The column total (C_2) is the count of all cases that are correctly paid ($STATUS=1$) and whose certification has not expired ($LASTCERT < CERTMTH-1$).

We determine the prior-month status of these cases, and thus their contribution to the cell counts in the second column, as follows (and as shown in Exhibit B-4):

- **nonparticipating** in prior month—The Q_{12} cell consists of households that have just been initially certified, as indicated by an initial certification that coincides with the review month ($ACTNTYPE = 1$ and $LASTCERT=0$).
- **ongoing correct** in prior month—The Q_{22} cell consists of ongoing cases for which no error existed in the preceding month, as indicated by the absence of any recent interim change (i.e., $ACTNTYPE = 1$ or 3 , or $ACTNTYPE = 5$ and $LASTACT > 0$). The rationale for this is the same as for the Q_{24} cell.
- **ongoing error** in prior month—The Q_{32} cell consists of ongoing cases for which an error has just been corrected, as indicated by a recent interim change ($ACTNTYPE = 5$ and $LASTACT = 0$). Here the logic is the same as for the Q_{34} cell.
- **expiring correct** in prior month—The Q_{42} cell count is computed as the row residual ($R_4 - Q_{41} - Q_{43}$).⁷
- **expiring error** in prior month—The Q_{52} cell count is computed under the assumption that, for a case entering recertification in error, the probability of becoming a correctly paid active case in the following month is the same as for an error case not undergoing recertification, which equals $(Q_{32} + Q_{34})/R_3$.

The assumption used in computing the Q_{52} cell count warrants further explanation, as it figures importantly in simulations of the effects of more frequent recertification. Because the QC data do not provide information on the prior-month error status of cases that are correct in the review month, some assumption is necessary for either Q_{42} or Q_{52} . Once one of these values is estimated, the other (along with Q_{41} and Q_{51}) can be computed as either a row or column residual.

⁷ The calculation of row and column residuals must proceed on a specified order. The value Q_{42} is the last to be derived, preceded by Q_{52} and the first-column cells.

Exhibit B-4: Derivation of Second-Column Cell Counts: Ongoing Correct Cases

Cell Count	Prior-month (“March”) status	Review-month (“April”) status	Criteria (based on variables from QC review, as defined in text)
Q ₁₂	Nonparticipating	Ongoing correct	initial certification in review month (ACTNTYPE=1 and LASTCERT=0) and correct in review month (STATUS=1)
Q ₂₂	Ongoing correct	Ongoing correct	certification not expiring (LASTCERT<CERTMTH-1) and correct in review month (STATUS=1)
Q ₃₂	Ongoing error	Ongoing correct	certification not expiring (LASTCERT<CERTMTH-1) and correct in review month (STATUS=1) interim action in review month (ACTNTYPE=5 and LASTACT=0)
Q ₄₂	Expiring correct	Ongoing correct	derived as $R_4 - Q_{41} - Q_{43}$; see text
Q ₅₂	Expiring error	Ongoing correct	derived as $((Q_{32}+Q_{34})/R_3)*R_5$; see text

Several alternate assumptions were tested. One was to assume that cases entering recertification as correctly paid (i.e., the expiring correct cases) should emerge upon recertification with an error rate equal to that of cases emerging from *initial* certification (later defined as the “first-month error rate”). We found, however, that this assumption, when used to compute the Q_{52} cell count, resulted in negative first-column entries in the national-level matrix, for several of the fiscal years under analysis. We did not adopt this assumption (nor several others that yielded similar results), as negative cell entries also appeared among many state-level matrices.

The assumption used in deriving Q_{52} minimized the extent of anomalous (negative) cell counts. This assumption might appear to inadequately capture the effectiveness of recertifications in removing errors from the active caseload. To the contrary, as will be seen later, this assumption yields rates of “error survival” that are one-third or one-fourth as large among *expiring* error cases (error cases subject to recertification) as among *ongoing* error cases (error cases not subject to recertification). Stated otherwise, a recertification will be shown to reduce very substantially (i.e., by more than one-half) the likelihood that an active error case remains so the following month.

Nonparticipating Households

The first column is comprised of households not participating in the Food Stamp Program in the review month. This includes the overwhelming majority of total U.S. households. The column total (C_1) is computed as the residual after subtracting the other four column totals from the total population ($Q - C_2 - C_3 - C_4 - C_5$). None of the cell entries in this column can be derived directly from the active case QC data, as nonparticipating households are not observed in active case reviews, by definition. Although there is a negative case action QC system for food stamp denials and terminations, the associated review process is not sufficient to establish whether a terminated case was correctly or incorrectly paid in its last month of participation.⁸

We determine the prior-month status of each case, and thus its contribution to the cell counts in the first column, as follows (and as shown in Exhibit B-5):

- nonparticipating in prior month—The Q_{11} cell consists of households that were nonparticipants in both the review month and the preceding month, computed as the first-row residual ($R_1 - Q_{12} - Q_{13}$).

⁸ See Mills (1990).

Exhibit B-5: Derivation of First-Column Cell Counts: Nonparticipating Households

Cell Count	Prior-month (“March”) status	Review-month (“April”) status	Criteria (derived as row or column residuals, as explained in text)
Q ₁₁	Nonparticipating	Nonparticipating	derived as R ₁ -Q ₁₂ -Q ₁₃ ; see text
Q ₂₁	Ongoing correct	Nonparticipating	derived as R ₂ -Q ₂₂ -Q ₂₃ -Q ₂₄ -Q ₂₅ ; see text
Q ₃₁	Ongoing error	Nonparticipating	derived as R ₃ -Q ₃₂ -Q ₃₃ -Q ₃₄ -Q ₃₅ ; see text
Q ₄₁	Expiring correct	Nonparticipating	derived as C ₁ -Q ₁₁ -Q ₂₁ -Q ₃₁ -Q ₅₁ ; see text
Q ₅₁	Expiring error	Nonparticipating	derived as R ₅ -Q ₅₂ -Q ₅₃ ; see text

- **ongoing correct** in prior month—The Q_{21} cell consists of households that have just left the caseload having previously been correctly paid in the midst of a certification period, computed as the second-row residual ($R_2 - Q_{22} - Q_{23} - Q_{24} - Q_{25}$).
- **ongoing error** in prior month—The Q_{31} cell consists of households that have just left the caseload having previously been incorrectly paid in the midst of a certification period, computed as the third-row residual ($R_3 - Q_{32} - Q_{33} - Q_{34} - Q_{35}$).
- **expiring correct** in prior month—The Q_{41} cell consists of households that have just left the caseload having previously been correctly paid at the end of a certification period, computed as the first-column residual ($C_1 - Q_{11} - Q_{21} - Q_{31} - Q_{51}$).⁹
- **expiring error** in prior month—The Q_{51} cell consists of households that have just left the caseload having previously been incorrectly paid at the end of a certification period, computed as the fifth-row residual ($R_5 - Q_{52} - Q_{53}$).

Because the first-column entries are computed as row residuals, based on cell counts in the other columns that are subject to sampling error, it is possible for the model to yield residuals that are negative in value. That is, for any given row, it is possible for the summed entries of the second through fifth cells to exceed the corresponding row total. Such first-column negative values are typically small, and we have imputed them as zero. This imputation (an upward change from a negative value) requires an offsetting downward adjustment elsewhere in the first column, to leave the first-column total unchanged. We make this downward adjustment in cell Q_{11} , to minimize the effect on the transition probabilities and error rate indicators that are derived from the cell counts. ***In the exhibits of this report, all imputed zero values are identified by asterisks to distinguish them from entries that are zero by definition or by estimate.***

⁹ It is necessary to first derive Q_{51} before computing Q_{41} .

Appendix C

National Estimates of Cell Counts and Transition Probabilities

[In this appendix, asterisked entries in the first column indicate imputed zero values for cells in which initial estimates yielded a negative entry. See Chapter 5 for explanation.

Note: Row entries may not sum to the indicated row total due to rounding.]

Exhibit C-1: Cell Counts, 1998

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households (in thousands)						
Nonparticipating	93,636	502	70	0	0	94,207
Ongoing correct	0 *	4,798	490	764	102	6,154
Ongoing error	362	198	516	1	97	1,174
Expiring correct	187	531	71	0	0	789
Expiring error	147	34	22	0	0	204
Total	94,332	6,064	1,168	765	199	102,528
Cell counts for households with earnings (in thousands)						
Nonparticipating	78,811	150	35	0	0	78,995
Ongoing correct	0 *	930	233	234	58	1,455
Ongoing error	187	95	146	0	37	464
Expiring correct	26	171	41	0	0	238
Expiring error	65	20	11	0	0	96
Total	79,090	1,365	466	234	94	81,248
Cell counts for households without earnings (in thousands)						
Nonparticipating	14,757	352	35	0	0	15,144
Ongoing correct	68	3,868	256	530	44	4,768
Ongoing error	174	104	371	0	60	710
Expiring correct	162	360	30	0	0	551
Expiring error	81	16	11	0	0	108
Total	15,242	4,700	703	531	105	21,280

Exhibit C-2: Cell Counts, 1999

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households (in thousands)						
Nonparticipating	95,623	518	63	0	0	96,204
Ongoing correct	276	4,431	390	678	67	5,841
Ongoing error	158	318	438	1	78	993
Expiring correct	123	499	65	0	0	687
Expiring error	82	48	20	0	0	150
Total	96,262	5,813	975	679	145	103,874
Cell counts for households with earnings (in thousands)						
Nonparticipating	80,367	153	31	0	0	80,551
Ongoing correct	36	869	188	219	42	1,354
Ongoing error	89	142	133	1	39	404
Expiring correct	26	157	38	0	0	221
Expiring error	45	29	7	0	0	82
Total	80,563	1,351	397	220	80	82,611
Cell counts for households without earnings (in thousands)						
Nonparticipating	15,257	365	32	0	0	15,653
Ongoing correct	240	3,561	202	459	25	4,487
Ongoing error	69	176	304	0	39	589
Expiring correct	97	341	27	0	0	466
Expiring error	35	20	12	0	0	68
Total	15,699	4,463	578	459	64	21,263

Exhibit C-3: Cell Counts, 2000

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households (in thousands)						
Nonparticipating	96,812	521	51	0	0	97,384
Ongoing correct	320	4,259	346	673	64	5,661
Ongoing error	70	328	368	3	74	845
Expiring correct	147	480	50	0	0	677
Expiring error	67	54	18	0	0	139
Total	97,416	5,643	832	676	138	104,705
Cell counts for households with earnings (in thousands)						
Nonparticipating	81,990	173	27	0	0	82,190
Ongoing correct	63	811	177	235	42	1,327
Ongoing error	72	140	112	2	32	357
Expiring correct	36	169	31	0	0	235
Expiring error	38	30	7	0	0	74
Total	82,199	1,323	353	236	74	84,184
Cell counts for households without earnings (in thousands)						
Nonparticipating	14,821	347	24	0	0	15,192
Ongoing correct	257	3,448	169	438	22	4,333
Ongoing error	0 *	188	257	2	43	489
Expiring correct	111	311	19	0	0	441
Expiring error	28	25	11	0	0	64
Total	15,217	4,320	480	440	64	20,521

Exhibit C-4: Cell Counts, 2001

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households (in thousands)						
Nonparticipating	98,385	574	57	0	0	99,015
Ongoing correct	485	4,302	337	633	56	5,814
Ongoing error	23	380	360	2	63	829
Expiring correct	72	509	58	0	0	640
Expiring error	51	56	14	0	0	121
Total	99,015	5,821	827	636	119	106,418
Cell counts for households with earnings (in thousands)						
Nonparticipating	83,049	190	29	0	0	83,268
Ongoing correct	141	846	160	211	29	1,387
Ongoing error	43	159	102	1	27	331
Expiring correct	10	169	33	0	0	212
Expiring error	25	28	4	0	0	58
Total	83,268	1,391	329	212	56	85,257
Cell counts for households without earnings (in thousands)						
Nonparticipating	15,318	384	27	0	0	15,729
Ongoing correct	344	3,456	177	422	27	4,427
Ongoing error	0 *	221	259	1	36	517
Expiring correct	60	340	25	0	0	425
Expiring error	25	28	10	0	0	63
Total	15,747	4,430	498	423	63	21,161

Exhibit C-5: Transition Probabilities, 1998

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.000 *	0.780	0.080	0.124	0.017	1.000
Ongoing error	0.308	0.169	0.440	0.000	0.083	1.000
Expiring correct	0.237	0.673	0.090	0.000	0.000	1.000
Expiring error	0.724	0.169	0.107	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.000 *	0.639	0.161	0.161	0.040	1.000
Ongoing error	0.404	0.204	0.314	0.000	0.079	1.000
Expiring correct	0.110	0.718	0.171	0.000	0.000	1.000
Expiring error	0.681	0.204	0.115	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.974	0.023	0.002	0.000	0.000	1.000
Ongoing correct	0.014	0.811	0.054	0.111	0.009	1.000
Ongoing error	0.246	0.146	0.522	0.001	0.085	1.000
Expiring correct	0.293	0.652	0.054	0.000	0.000	1.000
Expiring error	0.754	0.147	0.099	0.000	0.000	1.000

Exhibit C-6: Transition Probabilities, 1999

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.047	0.759	0.067	0.116	0.011	1.000
Ongoing error	0.159	0.320	0.441	0.001	0.079	1.000
Expiring correct	0.178	0.727	0.095	0.000	0.000	1.000
Expiring error	0.546	0.321	0.133	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.027	0.642	0.139	0.162	0.031	1.000
Ongoing error	0.220	0.351	0.330	0.002	0.096	1.000
Expiring correct	0.119	0.711	0.170	0.000	0.000	1.000
Expiring error	0.555	0.353	0.092	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.975	0.023	0.002	0.000	0.000	1.000
Ongoing correct	0.054	0.794	0.045	0.102	0.006	1.000
Ongoing error	0.117	0.299	0.517	0.001	0.066	1.000
Expiring correct	0.209	0.732	0.059	0.000	0.000	1.000
Expiring error	0.518	0.300	0.182	0.000	0.000	1.000

Exhibit C-7: Transition Probabilities, 2000

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.056	0.752	0.061	0.119	0.011	1.000
Ongoing error	0.083	0.389	0.436	0.004	0.088	1.000
Expiring correct	0.217	0.709	0.074	0.000	0.000	1.000
Expiring error	0.480	0.393	0.127	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.047	0.611	0.133	0.177	0.032	1.000
Ongoing error	0.201	0.392	0.313	0.005	0.089	1.000
Expiring correct	0.154	0.716	0.130	0.000	0.000	1.000
Expiring error	0.511	0.397	0.092	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.976	0.023	0.002	0.000	0.000	1.000
Ongoing correct	0.059	0.796	0.039	0.101	0.005	1.000
Ongoing error	0.000 *	0.385	0.525	0.003	0.087	1.000
Expiring correct	0.251	0.705	0.044	0.000	0.000	1.000
Expiring error	0.442	0.389	0.169	0.000	0.000	1.000

Exhibit C-8: Transition Probabilities, 2001

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.006	0.001	0.000	0.000	1.000
Ongoing correct	0.083	0.740	0.058	0.109	0.010	1.000
Ongoing error	0.028	0.459	0.435	0.003	0.076	1.000
Expiring correct	0.113	0.796	0.091	0.000	0.000	1.000
Expiring error	0.420	0.462	0.119	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.997	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.102	0.610	0.116	0.152	0.021	1.000
Ongoing error	0.128	0.480	0.307	0.004	0.081	1.000
Expiring correct	0.049	0.795	0.157	0.000	0.000	1.000
Expiring error	0.440	0.484	0.076	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.974	0.024	0.002	0.000	0.000	1.000
Ongoing correct	0.078	0.781	0.040	0.095	0.006	1.000
Ongoing error	0.000 *	0.428	0.501	0.002	0.070	1.000
Expiring correct	0.141	0.800	0.059	0.000	0.000	1.000
Expiring error	0.395	0.447	0.158	0.000	0.000	1.000

Appendix D

State-by-State Estimates of Cell Counts and Transition Probabilities

[In this appendix, asterisked entries in the first column indicate imputed zero values for cells in which initial estimates yielded a negative entry. See Chapter 5 for explanation.

Note: Row entries may not sum to the indicated row total due to rounding.]

State: Alabama

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,548,059	8,953	1,770	0	0	1,558,783
Ongoing correct	1,705	102,970	9,900	11,329	841	126,746
Ongoing error	7,547	4,174	8,613	0	993	21,327
Expiring correct	631	9,761	1,023	0	0	11,416
Expiring error	1,461	365	37	0	0	1,863
Total	1,559,404	126,223	21,344	11,329	1,834	1,720,134
Cell counts for households with earnings						
Nonparticipating	1,274,413	3,379	1,299	0	0	1,279,091
Ongoing correct	2,549	27,118	4,425	1,917	75	36,084
Ongoing error	3,641	2,340	3,526	0	225	9,732
Expiring correct	0*	2,953	469	0	0	3,422
Expiring error	194	73	37	0	0	305
Total	1,280,797	35,863	9,756	1,917	300	1,328,634
Cell counts for households without earnings						
Nonparticipating	271,280	5,574	471	0	0	277,325
Ongoing correct	0*	75,853	5,475	9,411	766	91,505
Ongoing error	3,913	1,834	5,087	0	768	11,602
Expiring correct	2,101	6,853	554	0	0	9,509
Expiring error	1,313	246	0	0	0	1,559
Total	278,607	90,360	11,588	9,411	1,534	391,501

State: Alabama

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.993	0.006	0.001	0.000	0.000	1.000
Ongoing correct	0.013	0.812	0.078	0.089	0.007	1.000
Ongoing error	0.354	0.196	0.404	0.000	0.047	1.000
Expiring correct	0.055	0.855	0.090	0.000	0.000	1.000
Expiring error	0.784	0.196	0.020	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.996	0.003	0.001	0.000	0.000	1.000
Ongoing correct	0.071	0.752	0.123	0.053	0.002	1.000
Ongoing error	0.374	0.240	0.362	0.000	0.023	1.000
Expiring correct	0.000*	0.863	0.137	0.000	0.000	1.000
Expiring error	0.637	0.240	0.123	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.978	0.020	0.002	0.000	0.000	1.000
Ongoing correct	0.000*	0.829	0.060	0.103	0.008	1.000
Ongoing error	0.337	0.158	0.438	0.000	0.066	1.000
Expiring correct	0.221	0.721	0.058	0.000	0.000	1.000
Expiring error	0.842	0.158	0.000	0.000	0.000	1.000

State: Alaska

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	208,226	1,301	286	0	0	209,814
Ongoing correct	1,114	6,805	2,068	258	88	10,333
Ongoing error	838	1,717	413	0	0	2,969
Expiring correct	0*	450	197	0	0	647
Expiring error	39	54	0	0	0	93
Total	210,217	10,327	2,965	258	88	223,856
Cell counts for households with earnings						
Nonparticipating	195,498	373	85	0	0	195,956
Ongoing correct	36	1,599	1,169	45	49	2,897
Ongoing error	556	781	120	0	0	1,457
Expiring correct	0*	113	83	0	0	197
Expiring error	23	27	0	0	0	50
Total	196,112	2,893	1,457	45	49	200,557
Cell counts for households without earnings						
Nonparticipating	12,735	928	201	0	0	13,864
Ongoing correct	1,072	5,207	900	213	39	7,431
Ongoing error	282	936	293	0	0	1,510
Expiring correct	0*	337	114	0	0	451
Expiring error	16	27	0	0	0	43
Total	14,105	7,434	1,508	213	39	23,299

State: Alaska

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.992	0.006	0.001	0.000	0.000	1.000
Ongoing correct	0.108	0.659	0.200	0.025	0.008	1.000
Ongoing error	0.282	0.578	0.139	0.000	0.000	1.000
Expiring correct	0.000*	0.695	0.305	0.000	0.000	1.000
Expiring error	0.422	0.578	0.000	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.012	0.552	0.403	0.016	0.017	1.000
Ongoing error	0.381	0.536	0.083	0.000	0.000	1.000
Expiring correct	0.000*	0.577	0.423	0.000	0.000	1.000
Expiring error	0.464	0.536	0.000	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.919	0.067	0.015	0.000	0.000	1.000
Ongoing correct	0.144	0.701	0.121	0.029	0.005	1.000
Ongoing error	0.187	0.620	0.194	0.000	0.000	1.000
Expiring correct	0.000*	0.746	0.254	0.000	0.000	1.000
Expiring error	0.380	0.620	0.000	0.000	0.000	1.000

State: Arizona

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,784,093	14,133	939	0	0	1,799,164
Ongoing correct	9,195	47,988	3,129	15,390	1,764	77,466
Ongoing error	2,284	2,306	1,315	0	617	6,521
Expiring correct	2,884	11,824	818	0	0	15,526
Expiring error	1,371	853	189	0	0	2,413
Total	1,799,826	77,103	6,390	15,390	2,381	1,901,090
Cell counts for households with earnings						
Nonparticipating	1,441,677	5,081	477	0	0	1,447,235
Ongoing correct	3,676	12,813	1,759	4,733	1,077	24,058
Ongoing error	1,524	996	477	0	271	3,268
Expiring correct	0*	4,702	407	0	0	5,109
Expiring error	850	419	104	0	0	1,373
Total	1,447,727	24,011	3,225	4,733	1,348	1,481,043
Cell counts for households without earnings						
Nonparticipating	342,099	9,052	462	0	0	351,612
Ongoing correct	5,520	35,175	1,370	10,656	688	53,409
Ongoing error	760	1,309	838	0	346	3,253
Expiring correct	3,184	7,138	411	0	0	10,733
Expiring error	536	418	85	0	0	1,040
Total	352,099	53,092	3,165	10,656	1,033	420,047

State: Arizona

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.992	0.008	0.001	0.000	0.000	1.000
Ongoing correct	0.119	0.619	0.040	0.199	0.023	1.000
Ongoing error	0.350	0.354	0.202	0.000	0.095	1.000
Expiring correct	0.186	0.762	0.053	0.000	0.000	1.000
Expiring error	0.568	0.354	0.078	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.996	0.004	0.000	0.000	0.000	1.000
Ongoing correct	0.153	0.533	0.073	0.197	0.045	1.000
Ongoing error	0.466	0.305	0.146	0.000	0.083	1.000
Expiring correct	0.000*	0.920	0.080	0.000	0.000	1.000
Expiring error	0.619	0.305	0.076	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.973	0.026	0.001	0.000	0.000	1.000
Ongoing correct	0.103	0.659	0.026	0.200	0.013	1.000
Ongoing error	0.234	0.403	0.258	0.000	0.106	1.000
Expiring correct	0.297	0.665	0.038	0.000	0.000	1.000
Expiring error	0.516	0.403	0.082	0.000	0.000	1.000

State: Arkansas

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	921,020	8,443	427	0	0	929,890
Ongoing correct	19,314	68,384	2,779	1,457	0	91,934
Ongoing error	0*	9,691	3,522	0	104	13,317
Expiring correct	0*	5,255	347	0	0	5,602
Expiring error	0*	148	61	0	0	209
Total	940,334	91,921	7,136	1,457	104	1,040,952
Cell counts for households with earnings						
Nonparticipating	780,026	2,787	268	0	0	783,081
Ongoing correct	6,505	17,114	1,395	264	0	25,279
Ongoing error	0*	3,705	1,075	0	42	4,822
Expiring correct	0*	1,694	204	0	0	1,898
Expiring error	0*	57	61	0	0	118
Total	786,531	25,357	3,003	264	42	815,198
Cell counts for households without earnings						
Nonparticipating	140,692	5,656	159	0	0	146,507
Ongoing correct	13,111	51,270	1,384	1,193	0	66,957
Ongoing error	0*	5,986	2,448	0	61	8,495
Expiring correct	0*	3,561	143	0	0	3,704
Expiring error	0*	92	0	0	0	92
Total	153,803	66,564	4,133	1,193	61	225,754

State: Arkansas

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.990	0.009	0.000	0.000	0.000	1.000
Ongoing correct	0.210	0.744	0.030	0.016	0.000	1.000
Ongoing error	0.000*	0.728	0.264	0.000	0.008	1.000
Expiring correct	0.000*	0.938	0.062	0.000	0.000	1.000
Expiring error	0.000*	0.707	0.293	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.996	0.004	0.000	0.000	0.000	1.000
Ongoing correct	0.257	0.677	0.055	0.010	0.000	1.000
Ongoing error	0.000*	0.768	0.223	0.000	0.009	1.000
Expiring correct	0.000*	0.893	0.107	0.000	0.000	1.000
Expiring error	0.000*	0.479	0.521	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.960	0.039	0.001	0.000	0.000	1.000
Ongoing correct	0.196	0.766	0.021	0.018	0.000	1.000
Ongoing error	0.000*	0.705	0.288	0.000	0.007	1.000
Expiring correct	0.000*	0.961	0.039	0.000	0.000	1.000
Expiring error	0.000*	1.000	0.000	0.000	0.000	1.000

State: California

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	10,427,591	29,742	4,251	0	0	10,461,583
Ongoing correct	0*	415,381	85,524	77,217	15,840	593,962
Ongoing error	83,471	1,595	50,617	0	11,265	146,948
Expiring correct	50,754	23,592	4,061	0	0	78,406
Expiring error	24,945	295	1,948	0	0	27,189
Total	10,586,761	470,605	146,401	77,217	27,104	11,308,088
Cell counts for households with earnings						
Nonparticipating	9,072,522	5,072	1,679	0	0	9,079,273
Ongoing correct	0*	118,621	38,703	22,865	6,187	186,376
Ongoing error	40,867	348	14,478	0	2,602	58,294
Expiring correct	13,634	6,827	2,522	0	0	22,983
Expiring error	8,562	53	297	0	0	8,912
Total	9,135,585	130,920	57,679	22,865	8,788	9,355,837
Cell counts for households without earnings						
Nonparticipating	1,354,783	24,670	2,572	0	0	1,382,025
Ongoing correct	0*	296,760	46,821	54,352	9,653	407,586
Ongoing error	42,744	1,248	36,139	0	8,663	88,793
Expiring correct	37,252	16,750	1,539	0	0	55,541
Expiring error	16,397	257	1,652	0	0	18,306
Total	1,451,176	339,685	88,722	54,352	18,316	1,952,251

State: California

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.997	0.003	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.699	0.144	0.130	0.027	1.000
Ongoing error	0.568	0.011	0.344	0.000	0.077	1.000
Expiring correct	0.647	0.301	0.052	0.000	0.000	1.000
Expiring error	0.917	0.011	0.072	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.999	0.001	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.636	0.208	0.123	0.033	1.000
Ongoing error	0.701	0.006	0.248	0.000	0.045	1.000
Expiring correct	0.593	0.297	0.110	0.000	0.000	1.000
Expiring error	0.961	0.006	0.033	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.980	0.018	0.002	0.000	0.000	1.000
Ongoing correct	0.000*	0.728	0.115	0.133	0.024	1.000
Ongoing error	0.481	0.014	0.407	0.000	0.098	1.000
Expiring correct	0.671	0.302	0.028	0.000	0.000	1.000
Expiring error	0.896	0.014	0.090	0.000	0.000	1.000

State: Colorado

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,588,329	7,013	654	0	0	1,595,996
Ongoing correct	14,098	41,000	2,883	3,157	676	61,814
Ongoing error	0*	5,209	4,327	41	264	9,840
Expiring correct	0*	7,522	741	0	0	8,263
Expiring error	117	557	275	0	0	949
Total	1,602,543	61,302	8,880	3,197	940	1,676,862
Cell counts for households with earnings						
Nonparticipating	1,415,249	2,568	319	0	0	1,418,137
Ongoing correct	4,016	8,568	1,819	1,179	505	16,087
Ongoing error	853	1,795	1,532	0	135	4,315
Expiring correct	0*	2,850	524	0	0	3,373
Expiring error	287	268	89	0	0	643
Total	1,420,405	16,048	4,283	1,179	640	1,442,556
Cell counts for households without earnings						
Nonparticipating	171,909	4,445	334	0	0	176,688
Ongoing correct	10,229	32,432	1,064	1,978	171	45,874
Ongoing error	0*	3,414	2,795	41	129	6,378
Expiring correct	0*	4,734	217	0	0	4,952
Expiring error	0*	228	186	0	0	414
Total	182,138	45,253	4,597	2,018	300	234,307

State: Colorado

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.995	0.004	0.000	0.000	0.000	1.000
Ongoing correct	0.228	0.663	0.047	0.051	0.011	1.000
Ongoing error	0.000*	0.529	0.440	0.004	0.027	1.000
Expiring correct	0.000*	0.910	0.090	0.000	0.000	1.000
Expiring error	0.123	0.587	0.290	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.250	0.533	0.113	0.073	0.031	1.000
Ongoing error	0.198	0.416	0.355	0.000	0.031	1.000
Expiring correct	0.000*	0.845	0.155	0.000	0.000	1.000
Expiring error	0.446	0.416	0.138	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.973	0.025	0.002	0.000	0.000	1.000
Ongoing correct	0.223	0.707	0.023	0.043	0.004	1.000
Ongoing error	0.000*	0.535	0.438	0.006	0.020	1.000
Expiring correct	0.000*	0.956	0.044	0.000	0.000	1.000
Expiring error	0.000*	0.551	0.449	0.000	0.000	1.000

State: Connecticut

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,196,412	4,552	725	0	0	1,201,689
Ongoing correct	0*	58,839	4,370	5,049	253	68,511
Ongoing error	4,642	419	7,504	0	840	13,404
Expiring correct	1,504	3,232	444	0	0	5,181
Expiring error	728	35	349	0	0	1,112
Total	1,203,286	67,076	13,392	5,049	1,093	1,289,897
Cell counts for households with earnings						
Nonparticipating	1,013,458	658	339	0	0	1,014,456
Ongoing correct	0*	5,320	1,474	297	165	7,256
Ongoing error	1,731	280	1,063	0	184	3,257
Expiring correct	0*	448	312	0	0	760
Expiring error	251	30	71	0	0	353
Total	1,015,441	6,737	3,259	297	348	1,026,083
Cell counts for households without earnings						
Nonparticipating	182,566	3,894	386	0	0	186,846
Ongoing correct	0*	53,518	2,896	4,751	88	61,254
Ongoing error	2,870	139	6,441	0	656	10,106
Expiring correct	1,942	2,778	133	0	0	4,852
Expiring error	467	10	278	0	0	755
Total	187,845	60,340	10,133	4,751	745	263,814

State: Connecticut

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.996	0.004	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.859	0.064	0.074	0.004	1.000
Ongoing error	0.346	0.031	0.560	0.000	0.063	1.000
Expiring correct	0.290	0.624	0.086	0.000	0.000	1.000
Expiring error	0.655	0.031	0.314	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.999	0.001	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.733	0.203	0.041	0.023	1.000
Ongoing error	0.531	0.086	0.326	0.000	0.056	1.000
Expiring correct	0.000*	0.590	0.410	0.000	0.000	1.000
Expiring error	0.712	0.086	0.202	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.977	0.021	0.002	0.000	0.000	1.000
Ongoing correct	0.000*	0.874	0.047	0.078	0.001	1.000
Ongoing error	0.284	0.014	0.637	0.000	0.065	1.000
Expiring correct	0.400	0.572	0.027	0.000	0.000	1.000
Expiring error	0.619	0.014	0.368	0.000	0.000	1.000

State: Delaware

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	277,625	1,450	252	0	0	279,327
Ongoing correct	0*	7,347	938	1,867	147	10,299
Ongoing error	837	271	1,071	0	275	2,454
Expiring correct	1,147	592	124	0	0	1,863
Expiring error	336	47	42	0	0	425
Total	279,944	9,708	2,426	1,867	422	294,368
Cell counts for households with earnings						
Nonparticipating	233,115	415	95	0	0	233,624
Ongoing correct	0*	1,503	558	488	57	2,607
Ongoing error	644	59	413	0	81	1,197
Expiring correct	198	169	113	0	0	481
Expiring error	134	7	0	0	0	141
Total	234,091	2,153	1,179	488	138	238,051
Cell counts for households without earnings						
Nonparticipating	44,508	1,035	157	0	0	45,700
Ongoing correct	0*	5,844	379	1,379	90	7,692
Ongoing error	193	212	658	0	194	1,257
Expiring correct	957	415	10	0	0	1,383
Expiring error	194	48	42	0	0	284
Total	45,853	7,554	1,247	1,379	284	56,317

State: Delaware

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.713	0.091	0.181	0.014	1.000
Ongoing error	0.341	0.111	0.436	0.000	0.112	1.000
Expiring correct	0.616	0.318	0.066	0.000	0.000	1.000
Expiring error	0.791	0.111	0.099	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.577	0.214	0.187	0.022	1.000
Ongoing error	0.538	0.049	0.345	0.000	0.068	1.000
Expiring correct	0.413	0.352	0.236	0.000	0.000	1.000
Expiring error	0.951	0.049	0.000	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.974	0.023	0.003	0.000	0.000	1.000
Ongoing correct	0.000*	0.760	0.049	0.179	0.012	1.000
Ongoing error	0.154	0.169	0.523	0.000	0.155	1.000
Expiring correct	0.692	0.300	0.007	0.000	0.000	1.000
Expiring error	0.683	0.169	0.148	0.000	0.000	1.000

State: District of Columbia

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	204,928	1,732	171	0	0	206,830
Ongoing correct	0*	23,076	2,447	2,970	234	28,727
Ongoing error	2,522	165	2,354	0	341	5,382
Expiring correct	629	1,943	378	0	0	2,950
Expiring error	507	17	42	0	0	567
Total	208,586	26,932	5,393	2,970	575	244,456
Cell counts for households with earnings						
Nonparticipating	194,890	154	41	0	0	195,085
Ongoing correct	0*	1,561	713	267	96	2,637
Ongoing error	774	13	473	0	111	1,371
Expiring correct	0*	167	121	0	0	288
Expiring error	175	2	28	0	0	204
Total	195,839	1,897	1,375	267	207	199,586
Cell counts for households without earnings						
Nonparticipating	9,994	1,578	130	0	0	11,702
Ongoing correct	0*	21,514	1,735	2,702	138	26,089
Ongoing error	1,763	152	1,881	0	230	4,026
Expiring correct	655	1,778	257	0	0	2,690
Expiring error	335	14	15	0	0	363
Total	12,747	25,035	4,017	2,702	368	44,871

State: District of Columbia

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.991	0.008	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.803	0.085	0.103	0.008	1.000
Ongoing error	0.469	0.031	0.437	0.000	0.063	1.000
Expiring correct	0.213	0.659	0.128	0.000	0.000	1.000
Expiring error	0.895	0.031	0.074	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.999	0.001	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.592	0.270	0.101	0.037	1.000
Ongoing error	0.565	0.009	0.345	0.000	0.081	1.000
Expiring correct	0.000*	0.579	0.421	0.000	0.000	1.000
Expiring error	0.855	0.009	0.135	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.854	0.135	0.011	0.000	0.000	1.000
Ongoing correct	0.000*	0.825	0.066	0.104	0.005	1.000
Ongoing error	0.438	0.038	0.467	0.000	0.057	1.000
Expiring correct	0.244	0.661	0.095	0.000	0.000	1.000
Expiring error	0.922	0.038	0.040	0.000	0.000	1.000

State: Florida

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	5,743,294	41,887	5,190	0	0	5,790,371
Ongoing correct	0*	235,145	20,990	53,197	6,549	315,882
Ongoing error	21,898	1,754	15,197	253	6,301	45,402
Expiring correct	18,180	32,620	3,096	0	0	53,896
Expiring error	12,060	578	434	0	0	13,072
Total	5,795,432	311,983	44,907	53,450	12,850	6,218,623
Cell counts for households with earnings						
Nonparticipating	4,516,931	12,972	2,586	0	0	4,532,490
Ongoing correct	0*	37,797	11,539	15,829	4,363	69,527
Ongoing error	12,042	796	4,134	164	3,542	20,677
Expiring correct	2,916	11,120	2,075	0	0	16,112
Expiring error	7,446	371	172	0	0	7,988
Total	4,539,336	63,056	20,506	15,992	7,904	4,646,795
Cell counts for households without earnings						
Nonparticipating	1,222,533	28,915	2,604	0	0	1,254,051
Ongoing correct	3,808	197,348	9,451	37,369	2,186	250,162
Ongoing error	9,863	958	11,063	89	2,759	24,733
Expiring correct	15,285	21,491	1,021	0	0	37,797
Expiring error	4,607	215	262	0	0	5,085
Total	1,256,096	248,927	24,401	37,458	4,946	1,571,828

State: Florida

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.992	0.007	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.744	0.066	0.168	0.021	1.000
Ongoing error	0.482	0.039	0.335	0.006	0.139	1.000
Expiring correct	0.337	0.605	0.057	0.000	0.000	1.000
Expiring error	0.923	0.044	0.033	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.997	0.003	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.544	0.166	0.228	0.063	1.000
Ongoing error	0.582	0.038	0.200	0.008	0.171	1.000
Expiring correct	0.181	0.690	0.129	0.000	0.000	1.000
Expiring error	0.932	0.046	0.021	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.975	0.023	0.002	0.000	0.000	1.000
Ongoing correct	0.015	0.789	0.038	0.149	0.009	1.000
Ongoing error	0.399	0.039	0.447	0.004	0.112	1.000
Expiring correct	0.404	0.569	0.027	0.000	0.000	1.000
Expiring error	0.906	0.042	0.052	0.000	0.000	1.000

State: Georgia

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	2,616,092	24,609	2,663	0	0	2,643,363
Ongoing correct	32,452	124,212	11,736	18,821	2,058	189,277
Ongoing error	3,083	12,803	11,746	60	2,805	30,497
Expiring correct	0*	25,125	3,177	0	0	28,301
Expiring error	2,273	2,158	685	0	0	5,117
Total	2,653,900	188,907	30,006	18,881	4,863	2,896,557
Cell counts for households with earnings						
Nonparticipating	2,331,469	9,187	1,419	0	0	2,342,075
Ongoing correct	9,628	21,704	5,904	7,591	1,282	46,109
Ongoing error	4,364	4,765	3,044	0	1,251	13,424
Expiring correct	0*	9,726	2,617	0	0	12,344
Expiring error	1,436	955	299	0	0	2,690
Total	2,346,898	46,337	13,284	7,591	2,533	2,416,643
Cell counts for households without earnings						
Nonparticipating	283,132	15,422	1,244	0	0	299,798
Ongoing correct	22,978	102,507	5,831	11,230	776	143,322
Ongoing error	0*	8,038	8,701	60	1,554	18,354
Expiring correct	0*	15,451	559	0	0	16,010
Expiring error	892	1,151	386	0	0	2,430
Total	307,002	142,570	16,722	11,290	2,330	479,914

State: Georgia

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.990	0.009	0.001	0.000	0.000	1.000
Ongoing correct	0.171	0.656	0.062	0.099	0.011	1.000
Ongoing error	0.101	0.420	0.385	0.002	0.092	1.000
Expiring correct	0.000*	0.888	0.112	0.000	0.000	1.000
Expiring error	0.444	0.422	0.134	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.995	0.004	0.001	0.000	0.000	1.000
Ongoing correct	0.209	0.471	0.128	0.165	0.028	1.000
Ongoing error	0.325	0.355	0.227	0.000	0.093	1.000
Expiring correct	0.000*	0.788	0.212	0.000	0.000	1.000
Expiring error	0.534	0.355	0.111	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.944	0.051	0.004	0.000	0.000	1.000
Ongoing correct	0.160	0.715	0.041	0.078	0.005	1.000
Ongoing error	0.000*	0.438	0.474	0.003	0.085	1.000
Expiring correct	0.000*	0.965	0.035	0.000	0.000	1.000
Expiring error	0.367	0.474	0.159	0.000	0.000	1.000

State: Hawaii

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	317,567	2,109	352	0	0	320,028
Ongoing correct	1,620	36,364	3,385	2,639	215	44,223
Ongoing error	476	3,317	3,048	0	217	7,059
Expiring correct	711	1,830	136	0	0	2,677
Expiring error	102	200	123	0	0	425
Total	320,477	43,821	7,043	2,639	432	374,413
Cell counts for households with earnings						
Nonparticipating	297,897	449	138	0	0	298,484
Ongoing correct	776	7,911	1,696	444	92	10,918
Ongoing error	0*	1,985	1,131	0	76	3,192
Expiring correct	0*	447	16	0	0	463
Expiring error	0*	107	77	0	0	184
Total	298,673	10,898	3,058	444	168	313,241
Cell counts for households without earnings						
Nonparticipating	19,336	1,660	214	0	0	21,210
Ongoing correct	973	28,453	1,688	2,196	123	33,434
Ongoing error	642	1,333	1,917	0	141	4,033
Expiring correct	723	1,390	120	0	0	2,233
Expiring error	130	87	46	0	0	262
Total	21,804	32,922	3,985	2,196	264	61,172

State: Hawaii

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.992	0.007	0.001	0.000	0.000	1.000
Ongoing correct	0.037	0.822	0.077	0.060	0.005	1.000
Ongoing error	0.067	0.470	0.432	0.000	0.031	1.000
Expiring correct	0.266	0.684	0.051	0.000	0.000	1.000
Expiring error	0.240	0.470	0.290	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.071	0.725	0.155	0.041	0.008	1.000
Ongoing error	0.000*	0.622	0.354	0.000	0.024	1.000
Expiring correct	0.000*	0.965	0.035	0.000	0.000	1.000
Expiring error	0.000*	0.580	0.420	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.912	0.078	0.010	0.000	0.000	1.000
Ongoing correct	0.029	0.851	0.051	0.066	0.004	1.000
Ongoing error	0.159	0.330	0.475	0.000	0.035	1.000
Expiring correct	0.324	0.623	0.054	0.000	0.000	1.000
Expiring error	0.495	0.330	0.175	0.000	0.000	1.000

State: Idaho

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	433,932	2,244	257	0	0	436,433
Ongoing correct	2,593	14,081	1,072	1,343	56	19,145
Ongoing error	26	1,337	1,105	0	169	2,637
Expiring correct	0*	1,318	143	0	0	1,461
Expiring error	72	120	45	0	0	236
Total	436,622	19,100	2,623	1,343	224	459,913
Cell counts for households with earnings						
Nonparticipating	365,305	1,123	187	0	0	366,615
Ongoing correct	1,374	4,609	679	558	56	7,277
Ongoing error	20	874	629	0	88	1,611
Expiring correct	0*	597	92	0	0	689
Expiring error	56	80	12	0	0	148
Total	366,755	7,283	1,600	558	143	376,340
Cell counts for households without earnings						
Nonparticipating	68,604	1,121	70	0	0	69,795
Ongoing correct	1,195	9,472	393	785	0	11,845
Ongoing error	4	463	476	0	81	1,024
Expiring correct	48	721	51	0	0	820
Expiring error	16	40	33	0	0	88
Total	69,867	11,817	1,023	785	81	83,573

State: Idaho

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.135	0.735	0.056	0.070	0.003	1.000
Ongoing error	0.010	0.507	0.419	0.000	0.064	1.000
Expiring correct	0.000*	0.902	0.098	0.000	0.000	1.000
Expiring error	0.303	0.507	0.190	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.996	0.003	0.001	0.000	0.000	1.000
Ongoing correct	0.189	0.633	0.093	0.077	0.008	1.000
Ongoing error	0.013	0.543	0.391	0.000	0.054	1.000
Expiring correct	0.000*	0.866	0.134	0.000	0.000	1.000
Expiring error	0.376	0.543	0.082	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.983	0.016	0.001	0.000	0.000	1.000
Ongoing correct	0.101	0.800	0.033	0.066	0.000	1.000
Ongoing error	0.004	0.452	0.465	0.000	0.079	1.000
Expiring correct	0.059	0.879	0.062	0.000	0.000	1.000
Expiring error	0.175	0.452	0.372	0.000	0.000	1.000

State: Illinois

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	4,084,878	23,389	1,992	0	0	4,110,260
Ongoing correct	64,613	195,853	21,171	9,806	1,004	292,446
Ongoing error	0*	42,435	26,075	64	1,413	69,987
Expiring correct	0*	28,391	6,571	0	0	34,962
Expiring error	0*	1,883	897	0	0	2,780
Total	4,149,491	291,951	56,706	9,870	2,417	4,510,435
Cell counts for households with earnings						
Nonparticipating	3,589,418	5,415	853	0	0	3,595,685
Ongoing correct	22,138	34,842	10,949	1,239	511	69,680
Ongoing error	0*	22,496	10,008	64	180	32,748
Expiring correct	0*	7,063	3,475	0	0	10,538
Expiring error	0*	640	345	0	0	985
Total	3,611,555	70,457	25,630	1,304	691	3,709,637
Cell counts for households without earnings						
Nonparticipating	494,488	17,975	1,139	0	0	513,602
Ongoing correct	43,303	161,010	10,222	8,566	493	223,593
Ongoing error	0*	19,939	16,067	0	1,233	37,239
Expiring correct	0*	21,430	3,096	0	0	24,526
Expiring error	145	1,141	553	0	0	1,838
Total	537,936	221,494	31,076	8,566	1,726	800,799

State: Illinois

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.006	0.000	0.000	0.000	1.000
Ongoing correct	0.221	0.670	0.072	0.034	0.003	1.000
Ongoing error	0.000*	0.606	0.373	0.001	0.020	1.000
Expiring correct	0.000*	0.812	0.188	0.000	0.000	1.000
Expiring error	0.000*	0.677	0.323	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.318	0.500	0.157	0.018	0.007	1.000
Ongoing error	0.000*	0.687	0.306	0.002	0.005	1.000
Expiring correct	0.000*	0.670	0.330	0.000	0.000	1.000
Expiring error	0.000*	0.650	0.350	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.963	0.035	0.002	0.000	0.000	1.000
Ongoing correct	0.194	0.720	0.046	0.038	0.002	1.000
Ongoing error	0.000*	0.535	0.431	0.000	0.033	1.000
Expiring correct	0.000*	0.874	0.126	0.000	0.000	1.000
Expiring error	0.079	0.621	0.301	0.000	0.000	1.000

State: Indiana

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	2,140,198	11,123	1,120	0	0	2,152,441
Ongoing correct	16,225	75,537	3,902	7,906	499	104,067
Ongoing error	0*	8,121	5,762	94	498	14,474
Expiring correct	0*	9,409	847	0	0	10,256
Expiring error	172	744	156	0	0	1,071
Total	2,156,595	104,933	11,787	7,999	997	2,282,311
Cell counts for households with earnings						
Nonparticipating	1,836,353	4,253	745	0	0	1,841,351
Ongoing correct	4,915	15,700	1,972	3,059	310	25,957
Ongoing error	453	2,550	1,872	0	250	5,125
Expiring correct	0*	3,490	467	0	0	3,958
Expiring error	245	303	61	0	0	608
Total	1,841,965	26,296	5,118	3,059	561	1,876,999
Cell counts for households without earnings						
Nonparticipating	303,167	6,870	375	0	0	310,412
Ongoing correct	11,462	59,836	1,930	4,847	188	78,264
Ongoing error	0*	5,571	3,890	94	248	9,802
Expiring correct	0*	5,968	380	0	0	6,348
Expiring error	0*	391	95	0	0	486
Total	314,630	78,637	6,669	4,941	436	405,312

State: Indiana

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.156	0.726	0.037	0.076	0.005	1.000
Ongoing error	0.000*	0.561	0.398	0.006	0.034	1.000
Expiring correct	0.000*	0.917	0.083	0.000	0.000	1.000
Expiring error	0.160	0.694	0.145	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.997	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.189	0.605	0.076	0.118	0.012	1.000
Ongoing error	0.088	0.498	0.365	0.000	0.049	1.000
Expiring correct	0.000*	0.882	0.118	0.000	0.000	1.000
Expiring error	0.402	0.498	0.101	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.977	0.022	0.001	0.000	0.000	1.000
Ongoing correct	0.146	0.765	0.025	0.062	0.002	1.000
Ongoing error	0.000*	0.568	0.397	0.010	0.025	1.000
Expiring correct	0.000*	0.940	0.060	0.000	0.000	1.000
Expiring error	0.000*	0.805	0.195	0.000	0.000	1.000

State: Iowa

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,075,320	5,354	651	0	0	1,081,325
Ongoing correct	9,993	32,447	3,260	1,196	52	46,948
Ongoing error	0*	7,412	2,356	0	170	9,938
Expiring correct	0*	1,375	236	0	0	1,611
Expiring error	0*	262	77	0	0	338
Total	1,085,312	46,850	6,580	1,196	222	1,140,160
Cell counts for households with earnings						
Nonparticipating	902,784	1,796	432	0	0	905,012
Ongoing correct	4,109	7,688	1,897	152	40	13,885
Ongoing error	0*	3,932	973	0	78	4,983
Expiring correct	0*	284	171	0	0	456
Expiring error	0*	137	52	0	0	189
Total	906,893	13,837	3,525	152	118	924,526
Cell counts for households without earnings						
Nonparticipating	172,378	3,558	219	0	0	176,155
Ongoing correct	6,042	24,759	1,363	1,043	13	33,220
Ongoing error	0*	3,480	1,383	0	91	4,954
Expiring correct	0*	1,091	64	0	0	1,155
Expiring error	0*	125	25	0	0	150
Total	178,420	33,013	3,055	1,043	104	215,634

State: Iowa

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.213	0.691	0.069	0.025	0.001	1.000
Ongoing error	0.000*	0.746	0.237	0.000	0.017	1.000
Expiring correct	0.000*	0.854	0.146	0.000	0.000	1.000
Expiring error	0.000*	0.773	0.227	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.296	0.554	0.137	0.011	0.003	1.000
Ongoing error	0.000*	0.789	0.195	0.000	0.016	1.000
Expiring correct	0.000*	0.624	0.376	0.000	0.000	1.000
Expiring error	0.000*	0.727	0.273	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.979	0.020	0.001	0.000	0.000	1.000
Ongoing correct	0.182	0.745	0.041	0.031	0.000	1.000
Ongoing error	0.000*	0.702	0.279	0.000	0.018	1.000
Expiring correct	0.000*	0.944	0.056	0.000	0.000	1.000
Expiring error	0.000*	0.832	0.168	0.000	0.000	1.000

State: Kansas

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	974,784	4,016	562	0	0	979,363
Ongoing correct	3,927	35,112	3,691	1,683	80	44,493
Ongoing error	517	3,848	3,025	0	82	7,473
Expiring correct	272	1,313	155	0	0	1,740
Expiring error	30	90	55	0	0	175
Total	979,532	44,379	7,488	1,683	162	1,033,244
Cell counts for households with earnings						
Nonparticipating	836,230	1,385	327	0	0	837,942
Ongoing correct	1,779	7,228	2,022	342	26	11,397
Ongoing error	132	2,276	911	0	27	3,346
Expiring correct	0*	423	52	0	0	476
Expiring error	0*	37	25	0	0	63
Total	838,142	11,350	3,338	342	53	853,224
Cell counts for households without earnings						
Nonparticipating	138,329	2,631	236	0	0	141,196
Ongoing correct	2,237	27,884	1,668	1,341	54	33,184
Ongoing error	395	1,572	2,115	0	55	4,136
Expiring correct	384	897	103	0	0	1,383
Expiring error	46	46	29	0	0	120
Total	141,390	33,029	4,150	1,341	109	180,020

State: Kansas

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.995	0.004	0.001	0.000	0.000	1.000
Ongoing correct	0.088	0.789	0.083	0.038	0.002	1.000
Ongoing error	0.069	0.515	0.405	0.000	0.011	1.000
Expiring correct	0.156	0.754	0.089	0.000	0.000	1.000
Expiring error	0.173	0.515	0.312	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.156	0.634	0.177	0.030	0.002	1.000
Ongoing error	0.039	0.680	0.272	0.000	0.008	1.000
Expiring correct	0.000*	0.890	0.110	0.000	0.000	1.000
Expiring error	0.000*	0.595	0.405	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.980	0.019	0.002	0.000	0.000	1.000
Ongoing correct	0.067	0.840	0.050	0.040	0.002	1.000
Ongoing error	0.095	0.380	0.511	0.000	0.013	1.000
Expiring correct	0.278	0.648	0.074	0.000	0.000	1.000
Expiring error	0.378	0.380	0.242	0.000	0.000	1.000

State: Kentucky

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,393,669	13,871	1,225	0	0	1,408,764
Ongoing correct	11,364	102,933	5,997	13,346	1,394	135,034
Ongoing error	0*	8,806	6,809	29	502	16,146
Expiring correct	4,246	8,562	916	0	0	13,724
Expiring error	704	1,157	102	0	0	1,963
Total	1,409,982	135,328	15,048	13,376	1,897	1,575,631
Cell counts for households with earnings						
Nonparticipating	1,163,425	5,167	660	0	0	1,169,252
Ongoing correct	3,322	17,569	2,618	5,480	1,074	30,064
Ongoing error	430	3,045	1,915	29	318	5,737
Expiring correct	1,330	3,728	522	0	0	5,580
Expiring error	604	762	56	0	0	1,422
Total	1,169,111	30,271	5,771	5,509	1,392	1,212,054
Cell counts for households without earnings						
Nonparticipating	229,586	8,703	565	0	0	238,854
Ongoing correct	8,249	85,363	3,379	7,866	320	105,177
Ongoing error	0*	5,761	4,893	0	184	10,839
Expiring correct	2,878	4,892	395	0	0	8,165
Expiring error	159	337	46	0	0	542
Total	240,871	105,057	9,278	7,866	505	363,577

State: Kentucky

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.989	0.010	0.001	0.000	0.000	1.000
Ongoing correct	0.084	0.762	0.044	0.099	0.010	1.000
Ongoing error	0.000*	0.545	0.422	0.002	0.031	1.000
Expiring correct	0.309	0.624	0.067	0.000	0.000	1.000
Expiring error	0.359	0.589	0.052	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.995	0.004	0.001	0.000	0.000	1.000
Ongoing correct	0.110	0.584	0.087	0.182	0.036	1.000
Ongoing error	0.075	0.531	0.334	0.005	0.055	1.000
Expiring correct	0.238	0.668	0.094	0.000	0.000	1.000
Expiring error	0.425	0.536	0.039	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.961	0.036	0.002	0.000	0.000	1.000
Ongoing correct	0.078	0.812	0.032	0.075	0.003	1.000
Ongoing error	0.000*	0.532	0.451	0.000	0.017	1.000
Expiring correct	0.352	0.599	0.048	0.000	0.000	1.000
Expiring error	0.293	0.622	0.085	0.000	0.000	1.000

State: Louisiana

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,431,494	18,280	2,332	0	0	1,452,106
Ongoing correct	8,924	111,245	6,695	22,280	1,940	151,084
Ongoing error	2,420	5,108	8,591	0	2,942	19,060
Expiring correct	6,451	15,135	1,235	0	0	22,821
Expiring error	3,374	1,338	282	0	0	4,994
Total	1,452,663	151,106	19,135	22,280	4,882	1,650,065
Cell counts for households with earnings						
Nonparticipating	1,240,375	6,893	1,281	0	0	1,248,549
Ongoing correct	1,043	26,289	3,741	9,774	1,618	42,464
Ongoing error	1,714	2,100	2,941	0	1,979	8,734
Expiring correct	2,565	6,738	705	0	0	10,008
Expiring error	2,633	879	144	0	0	3,657
Total	1,248,330	42,900	8,812	9,774	3,597	1,313,412
Cell counts for households without earnings						
Nonparticipating	190,631	11,387	1,051	0	0	203,069
Ongoing correct	8,282	84,957	2,954	12,506	322	109,021
Ongoing error	738	3,007	5,650	0	963	10,358
Expiring correct	3,867	8,466	531	0	0	12,864
Expiring error	814	389	137	0	0	1,340
Total	204,332	108,206	10,323	12,506	1,285	336,653

State: Louisiana

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.986	0.013	0.002	0.000	0.000	1.000
Ongoing correct	0.059	0.736	0.044	0.147	0.013	1.000
Ongoing error	0.127	0.268	0.451	0.000	0.154	1.000
Expiring correct	0.283	0.663	0.054	0.000	0.000	1.000
Expiring error	0.676	0.268	0.056	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.993	0.006	0.001	0.000	0.000	1.000
Ongoing correct	0.025	0.619	0.088	0.230	0.038	1.000
Ongoing error	0.196	0.240	0.337	0.000	0.227	1.000
Expiring correct	0.256	0.673	0.070	0.000	0.000	1.000
Expiring error	0.720	0.240	0.039	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.939	0.056	0.005	0.000	0.000	1.000
Ongoing correct	0.076	0.779	0.027	0.115	0.003	1.000
Ongoing error	0.071	0.290	0.545	0.000	0.093	1.000
Expiring correct	0.301	0.658	0.041	0.000	0.000	1.000
Expiring error	0.607	0.290	0.103	0.000	0.000	1.000

State: Maine

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	463,181	2,553	502	0	0	466,237
Ongoing correct	1,939	29,003	2,063	6,380	425	39,810
Ongoing error	1,393	1,774	2,288	16	608	6,079
Expiring correct	0*	6,075	960	0	0	7,035
Expiring error	462	304	266	0	0	1,032
Total	466,976	39,709	6,079	6,396	1,033	520,193
Cell counts for households with earnings						
Nonparticipating	391,687	811	228	0	0	392,727
Ongoing correct	436	2,879	648	2,182	259	6,404
Ongoing error	801	515	281	0	163	1,761
Expiring correct	0*	2,042	532	0	0	2,574
Expiring error	236	126	68	0	0	429
Total	393,160	6,373	1,756	2,182	423	403,895
Cell counts for households without earnings						
Nonparticipating	71,582	1,742	274	0	0	73,598
Ongoing correct	1,426	26,124	1,415	4,198	166	33,328
Ongoing error	582	1,259	2,007	16	444	4,309
Expiring correct	0*	4,033	429	0	0	4,462
Expiring error	226	178	198	0	0	602
Total	73,815	33,336	4,323	4,214	610	116,299

State: Maine

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.993	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.049	0.729	0.052	0.160	0.011	1.000
Ongoing error	0.229	0.292	0.376	0.003	0.100	1.000
Expiring correct	0.000*	0.863	0.137	0.000	0.000	1.000
Expiring error	0.448	0.295	0.258	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.997	0.002	0.001	0.000	0.000	1.000
Ongoing correct	0.068	0.450	0.101	0.341	0.040	1.000
Ongoing error	0.455	0.293	0.160	0.000	0.093	1.000
Expiring correct	0.000*	0.793	0.207	0.000	0.000	1.000
Expiring error	0.550	0.293	0.157	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.973	0.024	0.004	0.000	0.000	1.000
Ongoing correct	0.043	0.784	0.042	0.126	0.005	1.000
Ongoing error	0.135	0.292	0.466	0.004	0.103	1.000
Expiring correct	0.000*	0.904	0.096	0.000	0.000	1.000
Expiring error	0.375	0.296	0.330	0.000	0.000	1.000

State: Maryland

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,836,252	7,772	1,101	0	0	1,845,125
Ongoing correct	1,468	64,515	4,500	10,795	1,202	82,481
Ongoing error	3,536	1,721	9,293	0	2,052	16,602
Expiring correct	2,957	7,248	689	0	0	10,894
Expiring error	2,272	341	679	0	0	3,293
Total	1,846,486	81,597	16,263	10,795	3,255	1,958,395
Cell counts for households with earnings						
Nonparticipating	1,622,944	1,762	227	0	0	1,624,933
Ongoing correct	0*	9,304	1,943	2,494	693	14,434
Ongoing error	1,672	593	3,084	0	782	6,132
Expiring correct	0*	2,416	447	0	0	2,864
Expiring error	1,051	144	296	0	0	1,491
Total	1,625,667	14,221	5,997	2,494	1,475	1,649,854
Cell counts for households without earnings						
Nonparticipating	212,389	6,009	875	0	0	219,273
Ongoing correct	1,909	55,211	2,558	8,301	509	68,488
Ongoing error	1,909	1,127	6,208	0	1,270	10,515
Expiring correct	3,381	4,835	241	0	0	8,457
Expiring error	1,230	194	384	0	0	1,808
Total	220,819	67,376	10,266	8,301	1,779	308,541

State: Maryland

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.995	0.004	0.001	0.000	0.000	1.000
Ongoing correct	0.018	0.782	0.055	0.131	0.015	1.000
Ongoing error	0.213	0.104	0.560	0.000	0.124	1.000
Expiring correct	0.271	0.665	0.063	0.000	0.000	1.000
Expiring error	0.690	0.104	0.206	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.999	0.001	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.645	0.135	0.173	0.048	1.000
Ongoing error	0.273	0.097	0.503	0.000	0.128	1.000
Expiring correct	0.000*	0.844	0.156	0.000	0.000	1.000
Expiring error	0.705	0.097	0.198	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.969	0.027	0.004	0.000	0.000	1.000
Ongoing correct	0.028	0.806	0.037	0.121	0.007	1.000
Ongoing error	0.182	0.107	0.590	0.000	0.121	1.000
Expiring correct	0.400	0.572	0.029	0.000	0.000	1.000
Expiring error	0.681	0.107	0.212	0.000	0.000	1.000

State: Massachusetts

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	2,259,121	10,146	1,311	0	0	2,270,578
Ongoing correct	2,297	68,845	4,538	12,826	1,301	89,806
Ongoing error	5,422	931	4,694	55	1,091	12,193
Expiring correct	2,953	8,963	1,258	0	0	13,173
Expiring error	1,922	200	349	0	0	2,470
Total	2,271,713	89,085	12,150	12,881	2,392	2,388,220
Cell counts for households with earnings						
Nonparticipating	1,880,260	2,269	584	0	0	1,883,114
Ongoing correct	646	5,793	1,572	2,569	751	11,330
Ongoing error	2,090	304	574	28	278	3,274
Expiring correct	0*	2,733	419	0	0	3,152
Expiring error	812	106	130	0	0	1,048
Total	1,883,808	11,206	3,279	2,597	1,029	1,901,919
Cell counts for households without earnings						
Nonparticipating	378,570	7,876	727	0	0	387,174
Ongoing correct	1,472	63,052	2,966	10,258	550	78,297
Ongoing error	3,313	627	4,120	27	813	8,900
Expiring correct	3,455	6,220	838	0	0	10,513
Expiring error	1,095	104	219	0	0	1,418
Total	387,905	77,879	8,870	10,284	1,363	486,302

State: Massachusetts

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.995	0.004	0.001	0.000	0.000	1.000
Ongoing correct	0.026	0.767	0.051	0.143	0.014	1.000
Ongoing error	0.445	0.076	0.385	0.005	0.089	1.000
Expiring correct	0.224	0.680	0.095	0.000	0.000	1.000
Expiring error	0.778	0.081	0.141	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.001	0.000	0.000	0.000	1.000
Ongoing correct	0.057	0.511	0.139	0.227	0.066	1.000
Ongoing error	0.638	0.093	0.175	0.009	0.085	1.000
Expiring correct	0.000*	0.867	0.133	0.000	0.000	1.000
Expiring error	0.775	0.101	0.124	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.978	0.020	0.002	0.000	0.000	1.000
Ongoing correct	0.019	0.805	0.038	0.131	0.007	1.000
Ongoing error	0.372	0.070	0.463	0.003	0.091	1.000
Expiring correct	0.329	0.592	0.080	0.000	0.000	1.000
Expiring error	0.772	0.073	0.154	0.000	0.000	1.000

State: Michigan

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	3,477,093	18,980	3,143	0	0	3,499,216
Ongoing correct	5,715	173,890	16,339	17,283	1,841	215,069
Ongoing error	10,601	8,174	36,670	0	3,895	59,341
Expiring correct	4,001	11,778	1,484	0	0	17,263
Expiring error	3,674	793	1,288	0	0	5,755
Total	3,501,085	213,614	58,925	17,283	5,736	3,796,643
Cell counts for households with earnings						
Nonparticipating	2,901,436	6,322	1,714	0	0	2,909,471
Ongoing correct	0*	37,519	9,029	8,112	1,444	56,103
Ongoing error	6,456	3,778	14,021	0	2,266	26,522
Expiring correct	1,296	5,712	1,019	0	0	8,026
Expiring error	2,546	528	630	0	0	3,704
Total	2,911,734	53,858	26,413	8,112	3,711	3,003,827
Cell counts for households without earnings						
Nonparticipating	574,654	12,658	1,429	0	0	588,742
Ongoing correct	6,831	136,371	7,311	9,172	397	160,081
Ongoing error	4,061	4,395	22,649	0	1,629	32,734
Expiring correct	2,692	6,056	465	0	0	9,213
Expiring error	1,114	275	658	0	0	2,047
Total	589,351	159,755	32,513	9,172	2,026	792,817

State: Michigan

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.027	0.809	0.076	0.080	0.009	1.000
Ongoing error	0.179	0.138	0.618	0.000	0.066	1.000
Expiring correct	0.232	0.682	0.086	0.000	0.000	1.000
Expiring error	0.638	0.138	0.224	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.997	0.002	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.669	0.161	0.145	0.026	1.000
Ongoing error	0.243	0.142	0.529	0.000	0.085	1.000
Expiring correct	0.161	0.712	0.127	0.000	0.000	1.000
Expiring error	0.687	0.142	0.170	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.976	0.022	0.002	0.000	0.000	1.000
Ongoing correct	0.043	0.852	0.046	0.057	0.002	1.000
Ongoing error	0.124	0.134	0.692	0.000	0.050	1.000
Expiring correct	0.292	0.657	0.050	0.000	0.000	1.000
Expiring error	0.544	0.134	0.321	0.000	0.000	1.000

State: Minnesota

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,796,230	5,551	218	0	0	1,802,000
Ongoing correct	26,305	56,874	3,113	544	0	86,836
Ongoing error	0*	20,191	3,314	0	51	23,556
Expiring correct	0*	3,718	96	0	0	3,814
Expiring error	0*	178	94	0	0	271
Total	1,822,536	86,511	6,836	544	51	1,916,478
Cell counts for households with earnings						
Nonparticipating	1,581,606	1,626	120	0	0	1,583,353
Ongoing correct	8,033	8,089	1,532	120	0	17,774
Ongoing error	0*	7,259	1,008	0	0	8,267
Expiring correct	0*	782	74	0	0	856
Expiring error	0*	13	0	0	0	13
Total	1,589,639	17,768	2,734	120	0	1,610,262
Cell counts for households without earnings						
Nonparticipating	214,593	3,925	98	0	0	218,616
Ongoing correct	18,303	48,785	1,581	423	0	69,093
Ongoing error	0*	12,932	2,307	0	51	15,289
Expiring correct	0*	2,927	22	0	0	2,949
Expiring error	0*	175	94	0	0	268
Total	232,896	68,743	4,102	423	51	306,216

State: Minnesota

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.997	0.003	0.000	0.000	0.000	1.000
Ongoing correct	0.303	0.655	0.036	0.006	0.000	1.000
Ongoing error	0.000*	0.857	0.141	0.000	0.002	1.000
Expiring correct	0.000*	0.975	0.025	0.000	0.000	1.000
Expiring error	0.000*	0.655	0.345	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.999	0.001	0.000	0.000	0.000	1.000
Ongoing correct	0.452	0.455	0.086	0.007	0.000	1.000
Ongoing error	0.000*	0.878	0.122	0.000	0.000	1.000
Expiring correct	0.000*	0.914	0.086	0.000	0.000	1.000
Expiring error	0.000*	1.000	0.000	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.982	0.018	0.000	0.000	0.000	1.000
Ongoing correct	0.265	0.706	0.023	0.006	0.000	1.000
Ongoing error	0.000*	0.846	0.151	0.000	0.003	1.000
Expiring correct	0.000*	0.992	0.008	0.000	0.000	1.000
Expiring error	0.000*	0.651	0.349	0.000	0.000	1.000

State: Mississippi

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	880,263	6,809	468	0	0	887,540
Ongoing correct	22,466	73,219	5,338	3,565	103	104,691
Ongoing error	0*	17,761	3,213	0	62	21,035
Expiring correct	0*	6,015	489	0	0	6,504
Expiring error	0*	333	85	0	0	418
Total	902,729	104,136	9,593	3,565	165	1,020,188
Cell counts for households with earnings						
Nonparticipating	769,061	2,249	182	0	0	771,491
Ongoing correct	12,555	12,642	3,141	214	27	28,579
Ongoing error	0*	12,167	1,340	0	0	13,507
Expiring correct	0*	1,412	348	0	0	1,760
Expiring error	0*	80	32	0	0	112
Total	781,616	28,549	5,043	214	27	815,449
Cell counts for households without earnings						
Nonparticipating	110,675	4,561	286	0	0	115,521
Ongoing correct	10,438	60,577	2,197	3,351	77	76,639
Ongoing error	0*	5,594	1,873	0	62	7,529
Expiring correct	0*	4,676	142	0	0	4,817
Expiring error	0*	180	52	0	0	233
Total	121,113	75,587	4,550	3,351	138	204,739

State: Mississippi

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.992	0.008	0.001	0.000	0.000	1.000
Ongoing correct	0.215	0.699	0.051	0.034	0.001	1.000
Ongoing error	0.000*	0.844	0.153	0.000	0.003	1.000
Expiring correct	0.000*	0.925	0.075	0.000	0.000	1.000
Expiring error	0.000*	0.797	0.203	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.997	0.003	0.000	0.000	0.000	1.000
Ongoing correct	0.439	0.442	0.110	0.007	0.001	1.000
Ongoing error	0.000*	0.901	0.099	0.000	0.000	1.000
Expiring correct	0.000*	0.802	0.198	0.000	0.000	1.000
Expiring error	0.000*	0.712	0.288	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.958	0.039	0.002	0.000	0.000	1.000
Ongoing correct	0.136	0.790	0.029	0.044	0.001	1.000
Ongoing error	0.000*	0.743	0.249	0.000	0.008	1.000
Expiring correct	0.000*	0.971	0.029	0.000	0.000	1.000
Expiring error	0.000*	0.775	0.225	0.000	0.000	1.000

State: Missouri

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	2,031,166	13,701	1,156	0	0	2,046,024
Ongoing correct	16,322	92,185	5,815	21,257	2,214	137,793
Ongoing error	0*	8,857	6,856	68	2,231	18,011
Expiring correct	0*	20,788	2,471	0	0	23,258
Expiring error	1,472	2,297	653	0	0	4,422
Total	2,048,960	137,827	16,951	21,324	4,445	2,229,508
Cell counts for households with earnings						
Nonparticipating	1,742,642	5,163	654	0	0	1,748,459
Ongoing correct	5,139	14,937	2,208	7,510	1,385	31,179
Ongoing error	1,666	2,269	1,736	68	956	6,695
Expiring correct	0*	8,217	1,659	0	0	9,876
Expiring error	1,164	810	348	0	0	2,322
Total	1,750,612	31,397	6,605	7,578	2,341	1,798,532
Cell counts for households without earnings						
Nonparticipating	286,071	8,538	502	0	0	295,112
Ongoing correct	11,505	77,248	3,607	13,746	830	106,936
Ongoing error	0*	6,587	5,120	0	1,275	12,982
Expiring correct	290	12,739	811	0	0	13,840
Expiring error	481	1,318	305	0	0	2,105
Total	298,348	106,430	10,346	13,746	2,104	430,976

State: Missouri

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.993	0.007	0.001	0.000	0.000	1.000
Ongoing correct	0.118	0.669	0.042	0.154	0.016	1.000
Ongoing error	0.000*	0.492	0.381	0.004	0.124	1.000
Expiring correct	0.000*	0.894	0.106	0.000	0.000	1.000
Expiring error	0.333	0.519	0.148	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.997	0.003	0.000	0.000	0.000	1.000
Ongoing correct	0.165	0.479	0.071	0.241	0.044	1.000
Ongoing error	0.249	0.339	0.259	0.010	0.143	1.000
Expiring correct	0.000*	0.832	0.168	0.000	0.000	1.000
Expiring error	0.501	0.349	0.150	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.969	0.029	0.002	0.000	0.000	1.000
Ongoing correct	0.108	0.722	0.034	0.129	0.008	1.000
Ongoing error	0.000*	0.507	0.394	0.000	0.098	1.000
Expiring correct	0.021	0.920	0.059	0.000	0.000	1.000
Expiring error	0.229	0.626	0.145	0.000	0.000	1.000

State: Montana

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	331,098	1,818	172	0	0	333,089
Ongoing correct	5,626	13,436	1,596	701	28	21,387
Ongoing error	0*	5,136	1,478	0	58	6,673
Expiring correct	0*	905	98	0	0	1,003
Expiring error	0*	132	13	0	0	146
Total	336,724	21,428	3,358	701	86	362,298
Cell counts for households with earnings						
Nonparticipating	280,979	459	159	0	0	281,597
Ongoing correct	1,596	3,561	1,075	127	13	6,372
Ongoing error	0*	2,131	866	0	15	3,011
Expiring correct	0*	194	70	0	0	264
Expiring error	1	30	0	0	0	31
Total	282,575	6,374	2,169	127	28	291,274
Cell counts for households without earnings						
Nonparticipating	50,038	1,359	14	0	0	51,411
Ongoing correct	4,111	9,875	521	574	15	15,097
Ongoing error	0*	3,006	613	0	43	3,661
Expiring correct	0*	673	28	0	0	701
Expiring error	0*	141	13	0	0	154
Total	54,149	15,054	1,189	574	58	71,024

State: Montana

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.263	0.628	0.075	0.033	0.001	1.000
Ongoing error	0.000*	0.770	0.222	0.000	0.009	1.000
Expiring correct	0.000*	0.902	0.098	0.000	0.000	1.000
Expiring error	0.000*	0.908	0.092	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.001	0.000	0.000	1.000
Ongoing correct	0.250	0.559	0.169	0.020	0.002	1.000
Ongoing error	0.000*	0.708	0.287	0.000	0.005	1.000
Expiring correct	0.000*	0.736	0.264	0.000	0.000	1.000
Expiring error	0.019	0.981	0.000	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.973	0.026	0.000	0.000	0.000	1.000
Ongoing correct	0.272	0.654	0.035	0.038	0.001	1.000
Ongoing error	0.000*	0.821	0.167	0.000	0.012	1.000
Expiring correct	0.000*	0.960	0.040	0.000	0.000	1.000
Expiring error	0.000*	0.913	0.087	0.000	0.000	1.000

State: Nebraska

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	620,354	1,888	344	0	0	622,586
Ongoing correct	4,718	18,465	2,480	1,932	485	28,081
Ongoing error	0*	3,970	2,476	0	225	6,672
Expiring correct	0*	3,206	488	0	0	3,694
Expiring error	34	473	211	0	0	719
Total	625,106	28,004	5,999	1,932	710	661,752
Cell counts for households with earnings						
Nonparticipating	519,955	670	135	0	0	520,759
Ongoing correct	1,263	4,067	1,386	594	316	7,627
Ongoing error	314	1,583	1,425	0	91	3,413
Expiring correct	0*	1,089	320	0	0	1,409
Expiring error	107	192	115	0	0	415
Total	521,639	7,602	3,381	594	407	533,623
Cell counts for households without earnings						
Nonparticipating	100,096	1,219	210	0	0	101,524
Ongoing correct	3,372	14,398	1,094	1,338	169	20,370
Ongoing error	0*	2,387	1,051	0	135	3,573
Expiring correct	0*	2,120	168	0	0	2,288
Expiring error	0*	278	96	0	0	374
Total	103,468	20,402	2,618	1,338	303	128,129

State: Nebraska

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.996	0.003	0.001	0.000	0.000	1.000
Ongoing correct	0.168	0.658	0.088	0.069	0.017	1.000
Ongoing error	0.000*	0.595	0.371	0.000	0.034	1.000
Expiring correct	0.000*	0.868	0.132	0.000	0.000	1.000
Expiring error	0.047	0.659	0.294	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.001	0.000	0.000	0.000	1.000
Ongoing correct	0.166	0.533	0.182	0.078	0.041	1.000
Ongoing error	0.092	0.464	0.418	0.000	0.027	1.000
Expiring correct	0.000*	0.773	0.227	0.000	0.000	1.000
Expiring error	0.258	0.464	0.278	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.986	0.012	0.002	0.000	0.000	1.000
Ongoing correct	0.166	0.707	0.054	0.066	0.008	1.000
Ongoing error	0.000*	0.668	0.294	0.000	0.038	1.000
Expiring correct	0.000*	0.927	0.073	0.000	0.000	1.000
Expiring error	0.000*	0.743	0.257	0.000	0.000	1.000

State: Nevada

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	690,533	3,657	350	0	0	694,540
Ongoing correct	5,222	16,698	1,930	1,681	106	25,636
Ongoing error	1,035	1,673	358	13	48	3,127
Expiring correct	0*	3,323	411	0	0	3,734
Expiring error	63	90	14	0	0	167
Total	696,853	25,441	3,062	1,694	154	727,205
Cell counts for households with earnings						
Nonparticipating	592,261	992	261	0	0	593,515
Ongoing correct	656	2,275	909	494	47	4,381
Ongoing error	1,022	354	89	0	33	1,499
Expiring correct	0*	705	199	0	0	904
Expiring error	50	20	14	0	0	85
Total	593,990	4,346	1,473	494	80	600,384
Cell counts for households without earnings						
Nonparticipating	98,222	2,665	88	0	0	100,975
Ongoing correct	4,610	14,423	1,020	1,186	59	21,299
Ongoing error	17	1,319	269	13	15	1,632
Expiring correct	0*	2,621	212	0	0	2,833
Expiring error	15	67	0	0	0	82
Total	102,864	21,095	1,589	1,199	73	126,821

State: Nevada

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.204	0.651	0.075	0.066	0.004	1.000
Ongoing error	0.331	0.535	0.114	0.004	0.015	1.000
Expiring correct	0.000*	0.890	0.110	0.000	0.000	1.000
Expiring error	0.375	0.539	0.086	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.150	0.519	0.208	0.113	0.011	1.000
Ongoing error	0.682	0.236	0.060	0.000	0.022	1.000
Expiring correct	0.000*	0.780	0.220	0.000	0.000	1.000
Expiring error	0.595	0.236	0.169	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.973	0.026	0.001	0.000	0.000	1.000
Ongoing correct	0.216	0.677	0.048	0.056	0.003	1.000
Ongoing error	0.010	0.808	0.165	0.008	0.009	1.000
Expiring correct	0.000*	0.925	0.075	0.000	0.000	1.000
Expiring error	0.184	0.816	0.000	0.000	0.000	1.000

State: New Hampshire

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	443,903	1,523	241	0	0	445,666
Ongoing correct	0*	9,774	844	2,341	294	13,253
Ongoing error	667	256	902	13	380	2,218
Expiring correct	1,208	998	153	0	0	2,359
Expiring error	531	82	65	0	0	679
Total	446,310	12,633	2,205	2,354	674	464,177
Cell counts for households with earnings						
Nonparticipating	396,823	346	102	0	0	397,272
Ongoing correct	0*	1,436	333	455	163	2,388
Ongoing error	208	129	204	13	167	721
Expiring correct	202	196	62	0	0	461
Expiring error	255	66	13	0	0	334
Total	397,489	2,173	715	469	331	401,176
Cell counts for households without earnings						
Nonparticipating	47,013	1,176	138	0	0	48,327
Ongoing correct	0*	8,338	511	1,885	131	10,865
Ongoing error	485	127	698	0	213	1,523
Expiring correct	1,054	790	91	0	0	1,935
Expiring error	269	29	52	0	0	351
Total	48,821	10,461	1,490	1,885	343	63,001

State: New Hampshire

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.996	0.003	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.737	0.064	0.177	0.022	1.000
Ongoing error	0.301	0.115	0.407	0.006	0.171	1.000
Expiring correct	0.512	0.423	0.065	0.000	0.000	1.000
Expiring error	0.782	0.121	0.096	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.999	0.001	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.601	0.139	0.191	0.068	1.000
Ongoing error	0.289	0.178	0.282	0.019	0.232	1.000
Expiring correct	0.439	0.425	0.136	0.000	0.000	1.000
Expiring error	0.763	0.197	0.040	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.973	0.024	0.003	0.000	0.000	1.000
Ongoing correct	0.000*	0.767	0.047	0.174	0.012	1.000
Ongoing error	0.318	0.084	0.459	0.000	0.140	1.000
Expiring correct	0.545	0.408	0.047	0.000	0.000	1.000
Expiring error	0.768	0.084	0.148	0.000	0.000	1.000

State: New Jersey

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	2,833,427	5,010	452	0	0	2,838,889
Ongoing correct	0*	104,975	5,829	16,084	1,190	128,078
Ongoing error	4,677	633	13,919	0	2,862	22,091
Expiring correct	4,635	10,302	1,061	0	0	15,997
Expiring error	3,408	116	526	0	0	4,051
Total	2,846,147	121,036	21,788	16,084	4,052	3,009,107
Cell counts for households with earnings						
Nonparticipating	2,397,878	677	67	0	0	2,398,622
Ongoing correct	0*	12,368	1,945	2,598	530	17,441
Ongoing error	1,535	140	3,970	0	955	6,601
Expiring correct	291	1,863	406	0	0	2,560
Expiring error	1,338	31	117	0	0	1,486
Total	2,401,042	15,079	6,505	2,598	1,485	2,426,710
Cell counts for households without earnings						
Nonparticipating	435,662	4,333	386	0	0	440,381
Ongoing correct	0*	92,607	3,884	13,486	660	110,637
Ongoing error	3,082	494	9,948	0	1,907	15,431
Expiring correct	4,295	8,441	654	0	0	13,391
Expiring error	2,065	82	410	0	0	2,557
Total	445,105	105,956	15,282	13,486	2,567	582,397

State: New Jersey

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.820	0.046	0.126	0.009	1.000
Ongoing error	0.212	0.029	0.630	0.000	0.130	1.000
Expiring correct	0.290	0.644	0.066	0.000	0.000	1.000
Expiring error	0.841	0.029	0.130	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	1.000	0.000	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.709	0.112	0.149	0.030	1.000
Ongoing error	0.233	0.021	0.602	0.000	0.145	1.000
Expiring correct	0.114	0.728	0.159	0.000	0.000	1.000
Expiring error	0.900	0.021	0.079	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.989	0.010	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.837	0.035	0.122	0.006	1.000
Ongoing error	0.200	0.032	0.645	0.000	0.124	1.000
Expiring correct	0.321	0.630	0.049	0.000	0.000	1.000
Expiring error	0.808	0.032	0.160	0.000	0.000	1.000

State: New Mexico

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	582,383	6,316	1,073	0	0	589,772
Ongoing correct	0*	29,851	2,949	12,834	1,637	47,271
Ongoing error	3,024	532	2,438	0	1,339	7,333
Expiring correct	7,733	4,488	670	0	0	12,891
Expiring error	2,597	217	172	0	0	2,986
Total	595,736	41,404	7,303	12,834	2,976	660,254
Cell counts for households with earnings						
Nonparticipating	506,213	2,199	529	0	0	508,941
Ongoing correct	0*	6,641	1,262	5,497	794	14,194
Ongoing error	1,447	178	482	0	608	2,715
Expiring correct	3,122	2,044	344	0	0	5,511
Expiring error	1,248	93	78	0	0	1,420
Total	512,031	11,156	2,694	5,497	1,403	532,781
Cell counts for households without earnings						
Nonparticipating	76,133	4,117	545	0	0	80,795
Ongoing correct	0*	23,210	1,688	7,336	843	33,077
Ongoing error	1,590	354	1,956	0	731	4,631
Expiring correct	4,627	2,447	326	0	0	7,401
Expiring error	1,355	120	94	0	0	1,569
Total	83,706	30,248	4,609	7,336	1,574	127,473

State: New Mexico

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.987	0.011	0.002	0.000	0.000	1.000
Ongoing correct	0.000*	0.631	0.062	0.271	0.035	1.000
Ongoing error	0.412	0.073	0.332	0.000	0.183	1.000
Expiring correct	0.600	0.348	0.052	0.000	0.000	1.000
Expiring error	0.870	0.073	0.058	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.995	0.004	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.468	0.089	0.387	0.056	1.000
Ongoing error	0.533	0.066	0.177	0.000	0.224	1.000
Expiring correct	0.567	0.371	0.062	0.000	0.000	1.000
Expiring error	0.879	0.066	0.055	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.942	0.051	0.007	0.000	0.000	1.000
Ongoing correct	0.000*	0.702	0.051	0.222	0.025	1.000
Ongoing error	0.343	0.076	0.422	0.000	0.158	1.000
Expiring correct	0.625	0.331	0.044	0.000	0.000	1.000
Expiring error	0.864	0.076	0.060	0.000	0.000	1.000

State: New York

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	6,201,559	26,020	4,218	0	0	6,231,797
Ongoing correct	0*	479,327	30,924	56,603	2,715	569,569
Ongoing error	27,795	3,002	66,066	355	12,051	109,270
Expiring correct	15,193	37,997	4,773	0	0	57,962
Expiring error	12,105	466	2,606	0	0	15,178
Total	6,256,652	546,813	108,587	56,959	14,766	6,983,777
Cell counts for households with earnings						
Nonparticipating	5,335,762	5,089	1,886	0	0	5,342,737
Ongoing correct	0*	64,131	10,464	10,574	1,158	86,326
Ongoing error	9,092	741	10,778	166	4,777	25,553
Expiring correct	371	8,953	1,521	0	0	10,846
Expiring error	4,828	214	974	0	0	6,015
Total	5,350,052	79,127	25,622	10,740	5,935	5,471,478
Cell counts for households without earnings						
Nonparticipating	865,812	20,931	2,331	0	0	889,074
Ongoing correct	0*	415,196	20,461	46,030	1,557	483,243
Ongoing error	18,695	2,262	55,289	189	7,274	83,708
Expiring correct	14,832	29,028	3,251	0	0	47,111
Expiring error	7,261	268	1,632	0	0	9,162
Total	906,600	467,685	82,964	46,218	8,831	1,512,299

State: New York

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.995	0.004	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.842	0.054	0.099	0.005	1.000
Ongoing error	0.254	0.027	0.605	0.003	0.110	1.000
Expiring correct	0.262	0.656	0.082	0.000	0.000	1.000
Expiring error	0.798	0.031	0.172	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.999	0.001	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.743	0.121	0.122	0.013	1.000
Ongoing error	0.356	0.029	0.422	0.007	0.187	1.000
Expiring correct	0.034	0.826	0.140	0.000	0.000	1.000
Expiring error	0.803	0.035	0.162	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.974	0.024	0.003	0.000	0.000	1.000
Ongoing correct	0.000*	0.859	0.042	0.095	0.003	1.000
Ongoing error	0.223	0.027	0.660	0.002	0.087	1.000
Expiring correct	0.315	0.616	0.069	0.000	0.000	1.000
Expiring error	0.793	0.029	0.178	0.000	0.000	1.000

State: North Carolina

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	2,789,873	18,170	1,755	0	0	2,809,798
Ongoing correct	17,892	114,436	8,415	23,554	2,879	167,176
Ongoing error	4,546	7,750	6,865	188	1,616	20,965
Expiring correct	0*	24,368	3,152	0	0	27,520
Expiring error	2,561	1,753	317	0	0	4,631
Total	2,814,873	166,476	20,503	23,742	4,495	3,030,090
Cell counts for households with earnings						
Nonparticipating	2,407,811	6,943	1,019	0	0	2,415,773
Ongoing correct	3,755	17,375	4,272	9,528	1,730	36,659
Ongoing error	4,146	2,311	1,974	91	947	9,469
Expiring correct	0*	9,448	1,907	0	0	11,355
Expiring error	1,814	688	209	0	0	2,711
Total	2,417,527	36,765	9,381	9,619	2,677	2,475,968
Cell counts for households without earnings						
Nonparticipating	381,261	11,227	736	0	0	393,224
Ongoing correct	14,725	97,061	4,143	14,027	1,149	131,104
Ongoing error	462	5,438	4,891	97	669	11,558
Expiring correct	0*	15,060	1,245	0	0	16,305
Expiring error	899	925	108	0	0	1,932
Total	397,347	129,712	11,123	14,123	1,818	554,122

State: North Carolina

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.993	0.006	0.001	0.000	0.000	1.000
Ongoing correct	0.107	0.685	0.050	0.141	0.017	1.000
Ongoing error	0.217	0.370	0.327	0.009	0.077	1.000
Expiring correct	0.000*	0.885	0.115	0.000	0.000	1.000
Expiring error	0.553	0.379	0.068	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.997	0.003	0.000	0.000	0.000	1.000
Ongoing correct	0.102	0.474	0.117	0.260	0.047	1.000
Ongoing error	0.438	0.244	0.208	0.010	0.100	1.000
Expiring correct	0.000*	0.832	0.168	0.000	0.000	1.000
Expiring error	0.669	0.254	0.077	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.970	0.029	0.002	0.000	0.000	1.000
Ongoing correct	0.112	0.740	0.032	0.107	0.009	1.000
Ongoing error	0.040	0.471	0.423	0.008	0.058	1.000
Expiring correct	0.000*	0.924	0.076	0.000	0.000	1.000
Expiring error	0.465	0.479	0.056	0.000	0.000	1.000

State: North Dakota

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	233,272	868	106	0	0	234,246
Ongoing correct	2,207	8,459	740	707	44	12,156
Ongoing error	0*	1,952	350	28	24	2,354
Expiring correct	0*	843	142	0	0	985
Expiring error	0*	105	10	0	0	115
Total	235,479	12,226	1,348	735	68	249,856
Cell counts for households with earnings						
Nonparticipating	196,658	370	74	0	0	197,102
Ongoing correct	940	2,644	586	283	44	4,497
Ongoing error	0*	1,071	201	21	14	1,307
Expiring correct	0*	390	108	0	0	498
Expiring error	0*	66	0	0	0	66
Total	197,597	4,541	969	304	58	203,470
Cell counts for households without earnings						
Nonparticipating	36,598	498	32	0	0	37,128
Ongoing correct	1,284	5,815	154	424	0	7,676
Ongoing error	0*	880	149	8	10	1,047
Expiring correct	0*	460	34	0	0	494
Expiring error	0*	32	10	0	0	42
Total	37,882	7,685	378	431	10	46,387

State: North Dakota

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.996	0.004	0.000	0.000	0.000	1.000
Ongoing correct	0.182	0.696	0.061	0.058	0.004	1.000
Ongoing error	0.000*	0.829	0.149	0.012	0.010	1.000
Expiring correct	0.000*	0.856	0.144	0.000	0.000	1.000
Expiring error	0.000*	0.912	0.088	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.209	0.588	0.130	0.063	0.010	1.000
Ongoing error	0.000*	0.820	0.154	0.016	0.011	1.000
Expiring correct	0.000*	0.783	0.217	0.000	0.000	1.000
Expiring error	0.000*	1.000	0.000	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.986	0.013	0.001	0.000	0.000	1.000
Ongoing correct	0.167	0.758	0.020	0.055	0.000	1.000
Ongoing error	0.000*	0.841	0.142	0.007	0.010	1.000
Expiring correct	0.000*	0.932	0.068	0.000	0.000	1.000
Expiring error	0.000*	0.758	0.242	0.000	0.000	1.000

State: Ohio

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	4,034,999	19,196	2,105	0	0	4,056,300
Ongoing correct	26,948	179,452	9,717	23,547	2,178	241,842
Ongoing error	0*	14,005	14,790	0	1,876	30,672
Expiring correct	0*	26,398	2,271	0	0	28,668
Expiring error	1,557	2,014	757	0	0	4,328
Total	4,063,505	241,066	29,639	23,547	4,054	4,361,811
Cell counts for households with earnings						
Nonparticipating	3,355,048	6,481	999	0	0	3,362,529
Ongoing correct	3,772	24,094	4,592	10,275	1,604	44,338
Ongoing error	3,121	3,342	2,803	0	1,102	10,368
Expiring correct	0*	9,776	1,355	0	0	11,131
Expiring error	1,325	914	596	0	0	2,835
Total	3,363,267	44,608	10,345	10,275	2,707	3,431,202
Cell counts for households without earnings						
Nonparticipating	677,025	12,715	1,106	0	0	690,846
Ongoing correct	22,692	155,358	5,125	13,272	573	197,020
Ongoing error	0*	10,663	11,987	0	774	23,425
Expiring correct	0*	16,915	915	0	0	17,830
Expiring error	521	807	161	0	0	1,488
Total	700,238	196,458	19,294	13,272	1,347	930,609

State: Ohio

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.995	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.111	0.742	0.040	0.097	0.009	1.000
Ongoing error	0.000*	0.457	0.482	0.000	0.061	1.000
Expiring correct	0.000*	0.921	0.079	0.000	0.000	1.000
Expiring error	0.360	0.465	0.175	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.085	0.543	0.104	0.232	0.036	1.000
Ongoing error	0.301	0.322	0.270	0.000	0.106	1.000
Expiring correct	0.000*	0.878	0.122	0.000	0.000	1.000
Expiring error	0.467	0.322	0.210	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.980	0.018	0.002	0.000	0.000	1.000
Ongoing correct	0.115	0.789	0.026	0.067	0.003	1.000
Ongoing error	0.000*	0.455	0.512	0.000	0.033	1.000
Expiring correct	0.000*	0.949	0.051	0.000	0.000	1.000
Expiring error	0.350	0.542	0.108	0.000	0.000	1.000

State: Oklahoma

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,181,225	12,602	2,200	0	0	1,196,028
Ongoing correct	15,843	56,402	5,771	8,176	2,121	88,313
Ongoing error	3,233	6,724	3,966	22	443	14,388
Expiring correct	0*	11,232	2,085	0	0	13,317
Expiring error	1,104	1,221	279	0	0	2,604
Total	1,201,405	88,182	14,301	8,199	2,564	1,314,651
Cell counts for households with earnings						
Nonparticipating	1,000,102	5,236	1,343	0	0	1,006,682
Ongoing correct	4,272	8,558	2,690	3,856	1,649	21,025
Ongoing error	3,508	1,892	701	22	209	6,333
Expiring correct	0*	4,837	1,458	0	0	6,295
Expiring error	1,172	568	139	0	0	1,879
Total	1,009,054	21,090	6,331	3,878	1,858	1,042,212
Cell counts for households without earnings						
Nonparticipating	180,208	7,366	857	0	0	188,431
Ongoing correct	11,989	47,844	3,081	4,321	472	67,707
Ongoing error	0*	4,833	3,264	0	234	8,331
Expiring correct	0*	6,614	627	0	0	7,241
Expiring error	154	435	140	0	0	729
Total	192,351	67,092	7,969	4,321	706	272,439

State: Oklahoma

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.988	0.011	0.002	0.000	0.000	1.000
Ongoing correct	0.179	0.639	0.065	0.093	0.024	1.000
Ongoing error	0.225	0.467	0.276	0.002	0.031	1.000
Expiring correct	0.000*	0.843	0.157	0.000	0.000	1.000
Expiring error	0.424	0.469	0.107	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.993	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.203	0.407	0.128	0.183	0.078	1.000
Ongoing error	0.554	0.299	0.111	0.004	0.033	1.000
Expiring correct	0.000*	0.768	0.232	0.000	0.000	1.000
Expiring error	0.624	0.302	0.074	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.956	0.039	0.005	0.000	0.000	1.000
Ongoing correct	0.177	0.707	0.046	0.064	0.007	1.000
Ongoing error	0.000*	0.580	0.392	0.000	0.028	1.000
Expiring correct	0.000*	0.913	0.087	0.000	0.000	1.000
Expiring error	0.211	0.596	0.192	0.000	0.000	1.000

State: Oregon

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,217,018	6,277	1,250	0	0	1,224,544
Ongoing correct	29,750	55,049	8,225	3,372	292	96,689
Ongoing error	0*	25,905	5,467	112	304	31,788
Expiring correct	0*	8,822	1,344	0	0	10,166
Expiring error	0*	927	56	0	0	983
Total	1,246,768	96,979	16,342	3,484	597	1,364,170
Cell counts for households with earnings						
Nonparticipating	1,036,246	1,830	565	0	0	1,038,641
Ongoing correct	10,318	10,873	4,348	1,088	235	26,862
Ongoing error	0*	10,799	1,885	58	191	12,933
Expiring correct	0*	2,879	990	0	0	3,869
Expiring error	0*	569	29	0	0	599
Total	1,046,564	26,950	7,818	1,146	426	1,082,904
Cell counts for households without earnings						
Nonparticipating	180,784	4,447	684	0	0	185,915
Ongoing correct	19,420	44,176	3,878	2,284	58	69,815
Ongoing error	0*	15,106	3,582	54	114	18,855
Expiring correct	0*	5,992	354	0	0	6,347
Expiring error	0*	308	26	0	0	334
Total	200,204	70,029	8,525	2,338	171	281,267

State: Oregon

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.308	0.569	0.085	0.035	0.003	1.000
Ongoing error	0.000*	0.815	0.172	0.004	0.010	1.000
Expiring correct	0.000*	0.868	0.132	0.000	0.000	1.000
Expiring error	0.000*	0.943	0.057	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.001	0.000	0.000	1.000
Ongoing correct	0.384	0.405	0.162	0.041	0.009	1.000
Ongoing error	0.000*	0.835	0.146	0.004	0.015	1.000
Expiring correct	0.000*	0.744	0.256	0.000	0.000	1.000
Expiring error	0.000*	0.951	0.049	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.972	0.024	0.004	0.000	0.000	1.000
Ongoing correct	0.278	0.633	0.056	0.033	0.001	1.000
Ongoing error	0.000*	0.801	0.190	0.003	0.006	1.000
Expiring correct	0.000*	0.944	0.056	0.000	0.000	1.000
Expiring error	0.000*	0.921	0.079	0.000	0.000	1.000

State: Pennsylvania

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	4,309,278	20,190	1,731	0	0	4,331,198
Ongoing correct	15,210	241,941	19,306	19,034	876	296,368
Ongoing error	1,985	20,147	26,436	0	1,805	50,374
Expiring correct	6,382	11,664	1,350	0	0	19,396
Expiring error	634	1,100	1,016	0	0	2,750
Total	4,333,490	295,042	49,840	19,034	2,682	4,700,087
Cell counts for households with earnings						
Nonparticipating	3,490,770	4,662	434	0	0	3,495,866
Ongoing correct	5,332	47,535	10,867	3,547	786	68,067
Ongoing error	0*	13,326	9,952	0	735	24,013
Expiring correct	1,085	1,691	812	0	0	3,588
Expiring error	112	901	521	0	0	1,534
Total	3,497,299	68,114	22,587	3,547	1,521	3,593,069
Cell counts for households without earnings						
Nonparticipating	817,280	15,528	1,296	0	0	834,105
Ongoing correct	9,807	194,407	8,439	15,487	90	228,229
Ongoing error	3,291	6,821	16,484	0	1,071	27,667
Expiring correct	5,391	9,872	538	0	0	15,802
Expiring error	421	300	495	0	0	1,216
Total	836,191	226,928	27,253	15,487	1,161	1,107,019

State: Pennsylvania

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.995	0.005	0.000	0.000	0.000	1.000
Ongoing correct	0.051	0.816	0.065	0.064	0.003	1.000
Ongoing error	0.039	0.400	0.525	0.000	0.036	1.000
Expiring correct	0.329	0.601	0.070	0.000	0.000	1.000
Expiring error	0.231	0.400	0.369	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.999	0.001	0.000	0.000	0.000	1.000
Ongoing correct	0.078	0.698	0.160	0.052	0.012	1.000
Ongoing error	0.000*	0.555	0.414	0.000	0.031	1.000
Expiring correct	0.302	0.471	0.226	0.000	0.000	1.000
Expiring error	0.073	0.587	0.340	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.980	0.019	0.002	0.000	0.000	1.000
Ongoing correct	0.043	0.852	0.037	0.068	0.000	1.000
Ongoing error	0.119	0.247	0.596	0.000	0.039	1.000
Expiring correct	0.341	0.625	0.034	0.000	0.000	1.000
Expiring error	0.347	0.247	0.407	0.000	0.000	1.000

State: Rhode Island

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	371,761	1,283	94	0	0	373,139
Ongoing correct	370	21,104	1,364	3,342	112	26,291
Ongoing error	0*	2,047	1,652	0	152	3,850
Expiring correct	1,589	1,737	128	0	0	3,454
Expiring error	28	174	80	0	0	283
Total	373,748	26,345	3,318	3,342	264	407,018
Cell counts for households with earnings						
Nonparticipating	310,274	272	40	0	0	310,587
Ongoing correct	314	3,172	787	243	69	4,585
Ongoing error	92	805	637	0	29	1,563
Expiring correct	0*	308	64	0	0	372
Expiring error	12	55	40	0	0	107
Total	310,691	4,612	1,569	243	98	317,214
Cell counts for households without earnings						
Nonparticipating	61,177	1,011	54	0	0	62,242
Ongoing correct	141	17,932	577	3,100	43	21,792
Ongoing error	0*	1,242	1,014	0	123	2,379
Expiring correct	1,726	1,425	63	0	0	3,214
Expiring error	13	124	40	0	0	177
Total	63,057	21,733	1,749	3,100	166	89,805

State: Rhode Island

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.996	0.003	0.000	0.000	0.000	1.000
Ongoing correct	0.014	0.803	0.052	0.127	0.004	1.000
Ongoing error	0.000*	0.532	0.429	0.000	0.039	1.000
Expiring correct	0.460	0.503	0.037	0.000	0.000	1.000
Expiring error	0.101	0.615	0.284	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.999	0.001	0.000	0.000	0.000	1.000
Ongoing correct	0.068	0.692	0.172	0.053	0.015	1.000
Ongoing error	0.059	0.515	0.408	0.000	0.018	1.000
Expiring correct	0.000*	0.827	0.173	0.000	0.000	1.000
Expiring error	0.111	0.515	0.374	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.983	0.016	0.001	0.000	0.000	1.000
Ongoing correct	0.006	0.823	0.026	0.142	0.002	1.000
Ongoing error	0.000*	0.522	0.426	0.000	0.052	1.000
Expiring correct	0.537	0.443	0.020	0.000	0.000	1.000
Expiring error	0.071	0.701	0.228	0.000	0.000	1.000

State: South Carolina

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,352,323	8,045	609	0	0	1,360,976
Ongoing correct	13,461	75,703	4,567	4,720	242	98,693
Ongoing error	4,287	2,216	4,004	0	289	10,797
Expiring correct	0*	12,158	1,465	0	0	13,623
Expiring error	319	113	120	0	0	552
Total	1,370,390	98,236	10,764	4,720	531	1,484,642
Cell counts for households with earnings						
Nonparticipating	1,131,591	2,498	232	0	0	1,134,321
Ongoing correct	5,688	18,551	2,520	776	125	27,661
Ongoing error	2,822	908	944	0	59	4,733
Expiring correct	0*	5,569	983	0	0	6,552
Expiring error	130	38	30	0	0	197
Total	1,140,232	27,564	4,708	776	184	1,173,464
Cell counts for households without earnings						
Nonparticipating	220,810	5,547	377	0	0	226,734
Ongoing correct	7,700	57,152	2,047	3,944	117	70,961
Ongoing error	1,460	1,308	3,060	0	231	6,059
Expiring correct	0*	6,588	482	0	0	7,070
Expiring error	188	76	90	0	0	354
Total	230,158	70,671	6,056	3,944	348	311,178

State: South Carolina

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.006	0.000	0.000	0.000	1.000
Ongoing correct	0.136	0.767	0.046	0.048	0.002	1.000
Ongoing error	0.397	0.205	0.371	0.000	0.027	1.000
Expiring correct	0.000*	0.892	0.108	0.000	0.000	1.000
Expiring error	0.578	0.205	0.217	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.206	0.671	0.091	0.028	0.005	1.000
Ongoing error	0.596	0.192	0.199	0.000	0.012	1.000
Expiring correct	0.000*	0.850	0.150	0.000	0.000	1.000
Expiring error	0.658	0.192	0.150	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.974	0.024	0.002	0.000	0.000	1.000
Ongoing correct	0.109	0.805	0.029	0.056	0.002	1.000
Ongoing error	0.241	0.216	0.505	0.000	0.038	1.000
Expiring correct	0.000*	0.932	0.068	0.000	0.000	1.000
Expiring error	0.530	0.216	0.254	0.000	0.000	1.000

State: South Dakota

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	265,764	1,548	48	0	0	267,361
Ongoing correct	347	13,025	358	1,085	23	14,839
Ongoing error	406	0	245	0	58	709
Expiring correct	827	276	11	0	0	1,114
Expiring error	48	0	35	0	0	83
Total	267,392	14,850	698	1,085	81	284,106
Cell counts for households with earnings						
Nonparticipating	225,801	614	23	0	0	226,439
Ongoing correct	87	5,022	262	318	23	5,712
Ongoing error	285	0	94	0	12	391
Expiring correct	242	85	0	0	0	327
Expiring error	37	0	0	0	0	37
Total	226,452	5,721	379	318	35	232,906
Cell counts for households without earnings						
Nonparticipating	39,961	934	25	0	0	40,920
Ongoing correct	262	8,003	95	767	0	9,128
Ongoing error	121	0	151	0	46	318
Expiring correct	586	191	11	0	0	788
Expiring error	10	0	35	0	0	46
Total	40,940	9,128	319	767	46	51,201

State: South Dakota

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.006	0.000	0.000	0.000	1.000
Ongoing correct	0.023	0.878	0.024	0.073	0.002	1.000
Ongoing error	0.572	0.000	0.346	0.000	0.082	1.000
Expiring correct	0.742	0.248	0.010	0.000	0.000	1.000
Expiring error	0.574	0.000	0.426	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.997	0.003	0.000	0.000	0.000	1.000
Ongoing correct	0.015	0.879	0.046	0.056	0.004	1.000
Ongoing error	0.728	0.000	0.241	0.000	0.031	1.000
Expiring correct	0.740	0.260	0.000	0.000	0.000	1.000
Expiring error	1.000	0.000	0.000	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.977	0.023	0.001	0.000	0.000	1.000
Ongoing correct	0.029	0.877	0.010	0.084	0.000	1.000
Ongoing error	0.381	0.000	0.475	0.000	0.144	1.000
Expiring correct	0.743	0.242	0.014	0.000	0.000	1.000
Expiring error	0.226	0.000	0.774	0.000	0.000	1.000

State: Tennessee

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,941,130	12,314	1,350	0	0	1,954,794
Ongoing correct	0*	125,921	6,666	39,963	3,400	175,950
Ongoing error	6,979	1,095	6,431	186	2,613	17,304
Expiring correct	18,103	20,412	1,804	0	0	40,319
Expiring error	5,035	457	686	0	0	6,178
Total	1,971,246	160,199	16,936	40,150	6,013	2,194,545
Cell counts for households with earnings						
Nonparticipating	1,691,768	4,726	725	0	0	1,697,218
Ongoing correct	0*	19,300	3,033	14,565	2,307	39,205
Ongoing error	3,768	183	1,155	124	1,217	6,447
Expiring correct	5,542	7,929	1,307	0	0	14,777
Expiring error	3,243	172	188	0	0	3,603
Total	1,704,321	32,309	6,408	14,689	3,524	1,761,250
Cell counts for households without earnings						
Nonparticipating	249,318	7,588	626	0	0	257,532
Ongoing correct	0*	106,621	3,632	25,399	1,094	136,746
Ongoing error	3,226	912	5,276	62	1,396	10,872
Expiring correct	12,532	12,539	497	0	0	25,567
Expiring error	1,849	231	498	0	0	2,578
Total	266,926	127,891	10,529	25,461	2,490	433,296

State: Tennessee

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.993	0.006	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.716	0.038	0.227	0.019	1.000
Ongoing error	0.403	0.063	0.372	0.011	0.151	1.000
Expiring correct	0.449	0.506	0.045	0.000	0.000	1.000
Expiring error	0.815	0.074	0.111	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.997	0.003	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.492	0.077	0.372	0.059	1.000
Ongoing error	0.584	0.028	0.179	0.019	0.189	1.000
Expiring correct	0.375	0.537	0.088	0.000	0.000	1.000
Expiring error	0.900	0.048	0.052	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.968	0.029	0.002	0.000	0.000	1.000
Ongoing correct	0.000*	0.780	0.027	0.186	0.008	1.000
Ongoing error	0.297	0.084	0.485	0.006	0.128	1.000
Expiring correct	0.490	0.490	0.019	0.000	0.000	1.000
Expiring error	0.717	0.090	0.193	0.000	0.000	1.000

State: Texas

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	6,665,351	52,086	2,816	0	0	6,720,253
Ongoing correct	29,532	284,309	14,949	76,552	4,558	409,900
Ongoing error	0*	15,386	12,809	85	6,207	34,486
Expiring correct	26,761	49,379	1,692	0	0	77,832
Expiring error	4,905	5,006	1,239	0	0	11,150
Total	6,726,550	406,166	33,505	76,637	10,765	7,253,623
Cell counts for households with earnings						
Nonparticipating	5,924,138	21,195	1,681	0	0	5,947,013
Ongoing correct	0*	89,034	9,332	37,672	3,318	139,356
Ongoing error	2,342	6,477	6,335	85	3,743	18,981
Expiring correct	18,163	19,006	787	0	0	37,956
Expiring error	4,283	2,512	471	0	0	7,266
Total	5,948,926	138,224	18,605	37,756	7,061	6,150,573
Cell counts for households without earnings						
Nonparticipating	736,932	30,891	1,135	0	0	768,959
Ongoing correct	31,192	195,275	5,618	38,881	1,240	272,205
Ongoing error	0*	8,909	6,474	0	2,464	17,847
Expiring correct	8,593	30,632	906	0	0	40,130
Expiring error	907	2,235	767	0	0	3,909
Total	777,623	267,942	14,900	38,881	3,703	1,103,050

State: Texas

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.992	0.008	0.000	0.000	0.000	1.000
Ongoing correct	0.072	0.694	0.036	0.187	0.011	1.000
Ongoing error	0.000*	0.446	0.371	0.002	0.180	1.000
Expiring correct	0.344	0.634	0.022	0.000	0.000	1.000
Expiring error	0.440	0.449	0.111	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.996	0.004	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.639	0.067	0.270	0.024	1.000
Ongoing error	0.123	0.341	0.334	0.004	0.197	1.000
Expiring correct	0.479	0.501	0.021	0.000	0.000	1.000
Expiring error	0.589	0.346	0.065	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.958	0.040	0.001	0.000	0.000	1.000
Ongoing correct	0.115	0.717	0.021	0.143	0.005	1.000
Ongoing error	0.000*	0.499	0.363	0.000	0.138	1.000
Expiring correct	0.214	0.763	0.023	0.000	0.000	1.000
Expiring error	0.232	0.572	0.196	0.000	0.000	1.000

State: Utah

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	662,401	2,841	341	0	0	665,583
Ongoing correct	2,347	16,890	1,941	3,500	609	25,288
Ongoing error	804	1,621	1,116	0	535	4,075
Expiring correct	0*	3,349	512	0	0	3,861
Expiring error	534	453	152	0	0	1,139
Total	666,086	25,153	4,062	3,500	1,144	699,945
Cell counts for households with earnings						
Nonparticipating	582,345	929	283	0	0	583,557
Ongoing correct	68	4,177	1,115	1,606	432	7,399
Ongoing error	795	732	395	0	276	2,198
Expiring correct	61	1,230	335	0	0	1,626
Expiring error	417	235	54	0	0	707
Total	583,686	7,304	2,183	1,606	708	595,487
Cell counts for households without earnings						
Nonparticipating	80,019	1,912	58	0	0	81,990
Ongoing correct	2,245	12,713	826	1,894	177	17,855
Ongoing error	6	888	720	0	259	1,873
Expiring correct	0*	2,131	177	0	0	2,308
Expiring error	130	205	97	0	0	432
Total	82,400	17,850	1,879	1,894	436	104,459

State: Utah

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.995	0.004	0.001	0.000	0.000	1.000
Ongoing correct	0.093	0.668	0.077	0.138	0.024	1.000
Ongoing error	0.197	0.398	0.274	0.000	0.131	1.000
Expiring correct	0.000*	0.867	0.133	0.000	0.000	1.000
Expiring error	0.469	0.398	0.133	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.009	0.565	0.151	0.217	0.058	1.000
Ongoing error	0.362	0.333	0.180	0.000	0.125	1.000
Expiring correct	0.038	0.757	0.206	0.000	0.000	1.000
Expiring error	0.590	0.333	0.077	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.976	0.023	0.001	0.000	0.000	1.000
Ongoing correct	0.126	0.712	0.046	0.106	0.010	1.000
Ongoing error	0.003	0.474	0.385	0.000	0.138	1.000
Expiring correct	0.000*	0.923	0.077	0.000	0.000	1.000
Expiring error	0.301	0.474	0.225	0.000	0.000	1.000

State: Vermont

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	215,290	1,137	172	0	0	216,599
Ongoing correct	0*	13,095	924	1,719	118	15,857
Ongoing error	603	440	1,478	0	142	2,663
Expiring correct	822	836	91	0	0	1,749
Expiring error	224	44	0	0	0	268
Total	216,939	15,553	2,665	1,719	260	237,136
Cell counts for households with earnings						
Nonparticipating	186,330	257	107	0	0	186,693
Ongoing correct	0*	2,425	452	338	118	3,333
Ongoing error	350	188	555	0	68	1,162
Expiring correct	99	207	39	0	0	344
Expiring error	158	31	0	0	0	188
Total	186,937	3,107	1,152	338	186	191,721
Cell counts for households without earnings						
Nonparticipating	28,965	881	65	0	0	29,910
Ongoing correct	0*	10,670	472	1,381	0	12,524
Ongoing error	251	252	922	0	74	1,500
Expiring correct	721	629	53	0	0	1,402
Expiring error	66	13	0	0	0	79
Total	30,002	12,446	1,512	1,381	74	45,416

State: Vermont

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.005	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.826	0.058	0.108	0.007	1.000
Ongoing error	0.226	0.165	0.555	0.000	0.053	1.000
Expiring correct	0.470	0.478	0.052	0.000	0.000	1.000
Expiring error	0.835	0.165	0.000	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.001	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.728	0.136	0.101	0.035	1.000
Ongoing error	0.302	0.162	0.478	0.000	0.058	1.000
Expiring correct	0.286	0.601	0.112	0.000	0.000	1.000
Expiring error	0.838	0.162	0.000	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.968	0.029	0.002	0.000	0.000	1.000
Ongoing correct	0.000*	0.852	0.038	0.110	0.000	1.000
Ongoing error	0.167	0.168	0.615	0.000	0.050	1.000
Expiring correct	0.514	0.449	0.037	0.000	0.000	1.000
Expiring error	0.832	0.168	0.000	0.000	0.000	1.000

State: Virginia

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	2,479,114	9,863	1,222	0	0	2,490,199
Ongoing correct	0*	90,200	8,195	17,430	3,432	119,258
Ongoing error	7,268	3,079	5,732	40	1,387	17,507
Expiring correct	2,282	13,405	2,002	0	0	17,688
Expiring error	4,033	874	0	0	0	4,908
Total	2,492,698	117,421	17,151	17,470	4,819	2,649,559
Cell counts for households with earnings						
Nonparticipating	2,151,777	2,897	727	0	0	2,155,401
Ongoing correct	0*	16,846	5,053	5,392	2,902	30,193
Ongoing error	5,834	1,193	1,841	0	597	9,465
Expiring correct	0*	5,555	1,613	0	0	7,168
Expiring error	3,099	447	0	0	0	3,546
Total	2,160,710	26,939	9,234	5,392	3,499	2,205,774
Cell counts for households without earnings						
Nonparticipating	323,392	6,966	495	0	0	330,852
Ongoing correct	2,203	73,354	3,142	12,038	530	91,267
Ongoing error	1,438	1,886	3,891	40	790	8,045
Expiring correct	3,920	7,951	389	0	0	12,259
Expiring error	1,036	326	0	0	0	1,362
Total	331,988	90,482	7,917	12,078	1,320	443,786

State: Virginia

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.996	0.004	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.756	0.069	0.146	0.029	1.000
Ongoing error	0.415	0.176	0.327	0.002	0.079	1.000
Expiring correct	0.129	0.758	0.113	0.000	0.000	1.000
Expiring error	0.822	0.178	0.000	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.001	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.558	0.167	0.179	0.096	1.000
Ongoing error	0.616	0.126	0.195	0.000	0.063	1.000
Expiring correct	0.000*	0.775	0.225	0.000	0.000	1.000
Expiring error	0.874	0.126	0.000	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.977	0.021	0.001	0.000	0.000	1.000
Ongoing correct	0.024	0.804	0.034	0.132	0.006	1.000
Ongoing error	0.179	0.234	0.484	0.005	0.098	1.000
Expiring correct	0.320	0.649	0.032	0.000	0.000	1.000
Expiring error	0.761	0.239	0.000	0.000	0.000	1.000

State: Washington

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	2,096,392	12,714	1,842	0	0	2,110,947
Ongoing correct	4,762	78,720	7,090	16,938	1,453	108,964
Ongoing error	4,097	6,165	4,313	88	1,027	15,691
Expiring correct	6,043	9,347	1,499	0	0	16,889
Expiring error	1,089	991	408	0	0	2,488
Total	2,112,383	107,938	15,152	17,026	2,480	2,254,978
Cell counts for households with earnings						
Nonparticipating	1,792,455	3,202	978	0	0	1,796,635
Ongoing correct	795	13,184	3,131	3,484	595	21,189
Ongoing error	2,505	2,166	1,228	58	258	6,214
Expiring correct	720	2,247	517	0	0	3,484
Expiring error	295	303	250	0	0	848
Total	1,796,769	21,101	6,104	3,542	853	1,828,370
Cell counts for households without earnings						
Nonparticipating	304,109	9,512	864	0	0	314,484
Ongoing correct	3,833	65,537	3,959	13,454	858	87,640
Ongoing error	1,574	4,000	3,086	30	769	9,459
Expiring correct	5,315	7,091	982	0	0	13,388
Expiring error	782	698	158	0	0	1,638
Total	315,613	86,836	9,048	13,484	1,626	426,609

State: Washington

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.993	0.006	0.001	0.000	0.000	1.000
Ongoing correct	0.044	0.722	0.065	0.155	0.013	1.000
Ongoing error	0.261	0.393	0.275	0.006	0.065	1.000
Expiring correct	0.358	0.553	0.089	0.000	0.000	1.000
Expiring error	0.438	0.399	0.164	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.001	0.000	0.000	1.000
Ongoing correct	0.038	0.622	0.148	0.164	0.028	1.000
Ongoing error	0.403	0.349	0.198	0.009	0.042	1.000
Expiring correct	0.207	0.645	0.148	0.000	0.000	1.000
Expiring error	0.348	0.358	0.295	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.967	0.030	0.003	0.000	0.000	1.000
Ongoing correct	0.044	0.748	0.045	0.154	0.010	1.000
Ongoing error	0.166	0.423	0.326	0.003	0.081	1.000
Expiring correct	0.397	0.530	0.073	0.000	0.000	1.000
Expiring error	0.477	0.426	0.096	0.000	0.000	1.000

State: West Virginia

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	604,049	5,120	545	0	0	609,714
Ongoing correct	0*	62,252	4,104	15,307	1,355	83,018
Ongoing error	4,132	113	4,600	0	1,307	10,152
Expiring correct	9,304	5,379	556	0	0	15,239
Expiring error	2,529	30	137	0	0	2,695
Total	620,014	72,894	9,941	15,307	2,662	720,819
Cell counts for households with earnings						
Nonparticipating	484,600	1,750	343	0	0	486,693
Ongoing correct	0*	9,619	1,902	6,310	838	18,669
Ongoing error	1,944	80	799	0	667	3,490
Expiring correct	4,248	1,623	333	0	0	6,203
Expiring error	1,453	35	24	0	0	1,512
Total	492,244	13,107	3,400	6,310	1,506	516,568
Cell counts for households without earnings						
Nonparticipating	119,390	3,370	201	0	0	122,961
Ongoing correct	0*	52,634	2,202	8,997	516	64,350
Ongoing error	2,214	33	3,801	0	640	6,688
Expiring correct	5,098	3,745	223	0	0	9,066
Expiring error	1,069	6	113	0	0	1,187
Total	127,770	59,787	6,541	8,997	1,156	204,251

State: West Virginia

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.991	0.008	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.750	0.049	0.184	0.016	1.000
Ongoing error	0.407	0.011	0.453	0.000	0.129	1.000
Expiring correct	0.611	0.353	0.036	0.000	0.000	1.000
Expiring error	0.938	0.011	0.051	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.996	0.004	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.515	0.102	0.338	0.045	1.000
Ongoing error	0.557	0.023	0.229	0.000	0.191	1.000
Expiring correct	0.685	0.262	0.054	0.000	0.000	1.000
Expiring error	0.961	0.023	0.016	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.971	0.027	0.002	0.000	0.000	1.000
Ongoing correct	0.000*	0.818	0.034	0.140	0.008	1.000
Ongoing error	0.331	0.005	0.568	0.000	0.096	1.000
Expiring correct	0.562	0.413	0.025	0.000	0.000	1.000
Expiring error	0.900	0.005	0.095	0.000	0.000	1.000

State: Wisconsin

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	1,990,174	7,171	1,260	0	0	1,998,605
Ongoing correct	0*	39,737	3,824	10,668	1,269	55,498
Ongoing error	2,743	2,264	2,832	32	1,425	9,297
Expiring correct	4,878	4,857	1,086	0	0	10,821
Expiring error	1,780	674	273	0	0	2,727
Total	1,999,575	54,703	9,276	10,700	2,694	2,076,949
Cell counts for households with earnings						
Nonparticipating	1,642,911	2,588	790	0	0	1,646,290
Ongoing correct	0*	8,763	1,948	4,323	640	15,674
Ongoing error	1,642	1,022	890	17	815	4,384
Expiring correct	1,641	2,080	613	0	0	4,334
Expiring error	986	347	133	0	0	1,467
Total	1,647,180	14,801	4,374	4,339	1,455	1,672,150
Cell counts for households without earnings						
Nonparticipating	347,296	4,582	470	0	0	352,348
Ongoing correct	0*	30,974	1,876	6,345	628	39,824
Ongoing error	1,091	1,243	1,942	16	610	4,902
Expiring correct	3,214	2,781	473	0	0	6,468
Expiring error	794	323	140	0	0	1,257
Total	352,395	39,902	4,902	6,361	1,239	404,799

State: Wisconsin

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.996	0.004	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.716	0.069	0.192	0.023	1.000
Ongoing error	0.295	0.244	0.305	0.003	0.153	1.000
Expiring correct	0.451	0.449	0.100	0.000	0.000	1.000
Expiring error	0.653	0.247	0.100	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.998	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.559	0.124	0.276	0.041	1.000
Ongoing error	0.374	0.233	0.203	0.004	0.186	1.000
Expiring correct	0.379	0.480	0.141	0.000	0.000	1.000
Expiring error	0.672	0.237	0.091	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.986	0.013	0.001	0.000	0.000	1.000
Ongoing correct	0.000*	0.778	0.047	0.159	0.016	1.000
Ongoing error	0.223	0.254	0.396	0.003	0.125	1.000
Expiring correct	0.497	0.430	0.073	0.000	0.000	1.000
Expiring error	0.632	0.257	0.111	0.000	0.000	1.000

State: Wyoming

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Cell counts for total households						
Nonparticipating	180,401	1,018	73	0	0	181,492
Ongoing correct	188	5,022	239	1,636	36	7,122
Ongoing error	159	190	147	0	37	533
Expiring correct	750	827	47	0	0	1,624
Expiring error	45	29	7	0	0	80
Total	181,543	7,086	513	1,636	73	190,852
Cell counts for households with earnings						
Nonparticipating	152,287	371	50	0	0	152,707
Ongoing correct	0*	1,666	157	908	36	2,768
Ongoing error	127	90	78	0	30	324
Expiring correct	338	531	23	0	0	892
Expiring error	43	19	7	0	0	69
Total	152,794	2,676	315	908	66	156,760
Cell counts for households without earnings						
Nonparticipating	28,059	647	23	0	0	28,729
Ongoing correct	246	3,356	82	728	0	4,413
Ongoing error	31	101	69	0	8	208
Expiring correct	406	300	24	0	0	730
Expiring error	6	5	0	0	0	11
Total	28,748	4,410	198	728	8	34,092

State: Wyoming

Current-month status	Next-month status					Total
	Non-participating	Ongoing correct	Ongoing error	Expiring correct	Expiring error	
Transition probabilities for total households						
Nonparticipating	0.994	0.006	0.000	0.000	0.000	1.000
Ongoing correct	0.026	0.705	0.034	0.230	0.005	1.000
Ongoing error	0.298	0.357	0.275	0.000	0.070	1.000
Expiring correct	0.462	0.509	0.029	0.000	0.000	1.000
Expiring error	0.561	0.357	0.081	0.000	0.000	1.000
Transition probabilities for households with earnings						
Nonparticipating	0.997	0.002	0.000	0.000	0.000	1.000
Ongoing correct	0.000*	0.602	0.057	0.328	0.013	1.000
Ongoing error	0.391	0.277	0.240	0.000	0.092	1.000
Expiring correct	0.379	0.595	0.026	0.000	0.000	1.000
Expiring error	0.629	0.277	0.095	0.000	0.000	1.000
Transition probabilities for households without earnings						
Nonparticipating	0.977	0.023	0.001	0.000	0.000	1.000
Ongoing correct	0.056	0.761	0.019	0.165	0.000	1.000
Ongoing error	0.150	0.484	0.330	0.000	0.036	1.000
Expiring correct	0.556	0.411	0.033	0.000	0.000	1.000
Expiring error	0.516	0.484	0.000	0.000	0.000	1.000

Appendix E

Discrete Time Markov Chains

This material is drawn from the following website for the University of Texas at Dallas, which provides Fall 2003 course notes for "Computer Sciences 6352: Performance of Computer Systems and Networks" (instructor: Assistant Professor Jason Jue):
<http://www.utdallas.edu/~jjue/cs6352/markov>.

Discrete-Time Markov Chains

A Markov chain is a discrete state space process in which the next state depends only on the present state.

For a discrete time system, if X_n is the state of the system at time n , then $\{X_n : n \geq 0\}$ is a Markov chain if:

$$Pr [X_n = j | X_{n-1} = i_{n-1}, X_{n-2} = i_{n-2}, \dots, X_0 = i_0] = Pr [X_n = j | X_{n-1} = i_{n-1}],$$

i.e., the state (j) of the system at time n depends only on the state (i) of the system at time $n - 1$, and does not depend on any other state before time $n - 1$.

State Probabilities

The state probability, denoted as $\pi_j(n)$, is the probability that the process is in state j at time n .

$$\pi_j(n) = Pr\{X_n = j\}$$

The state probability vector is denoted as $\Pi(n)$, and consists of all of the state probabilities for a given time n .

$$\Pi(n) = [\pi_0(n) \quad \pi_1(n) \quad \pi_2(n) \quad \dots]$$

Note that the sum over the elements in $\Pi(n)$ is equal to 1.

$$\sum_j \pi_j(n) = 1$$

Transition Probabilities

The *one-step transition probability* is the probability of transitioning from one state to another in a single step. The Markov chain is said to be time homogeneous if the transition probabilities from one state to another are independent of time index n .

$$p_{ij} = Pr\{X_n = j | X_{n-1} = i\}$$

The *transition probability matrix*, P , is the matrix consisting of the one-step transition probabilities, p_{ij} .

The *m-step transition probability* is the probability of transitioning from state i to state j in m steps.

$$p_{ij}^{(m)} = Pr\{X_{n+m} = j | X_n = i\}$$

The *m-step transition matrix* whose elements are the *m-step transition probabilities* $p_{ij}^{(m)}$ is denoted as $P^{(m)}$.

The *m-step transition probabilities* can be found from the single-step transition probabilities as follows.

To transition from i to j in m steps, the process can first transition from i to r in $m - k$ steps, and then transition from r to j in k steps, where $0 < k < m$.

$$p_{ij}^{(m)} = \sum_r p_{ir}^{m-k} p_{rj}^k$$

In matrix form, this becomes:

$$P^{(m)} = P^{(m-k)} P^{(k)}$$

Setting $k = m - 1$ yields:

$$P^{(m)} = P \cdot P^{(m-1)}$$

From this equation we can see that:

$$P^{(m-1)} = P \cdot P^{(m-2)}$$

Substituting this back into the previous equation yields:

$$P^{(m)} = P \cdot P \cdot P^{(m-2)}$$

Continuing these substitutions, eventually we have:

$$P^{(m)} = P \cdot P \cdot P \dots P = P^m$$

Therefore, the m -step transition probability matrix can be found by multiplying the single-step probability matrix by itself m times.

The state vector at time m can also be found in terms of the transition probability matrix and the initial state vector $\Pi(0)$. We first observe that:

$$\pi_j(m) = \sum_i \pi_i(m-1)p_{ij}$$

In vector and matrix form, this becomes:

$$\Pi(m) = \Pi(m-1)P$$

We also find that, through substitution:

$$\Pi(m-1) = \Pi(m-2)P$$

or,

$$\Pi(m) = \Pi(m-2)P \cdot P$$

Continuing the substitution yields:

$$\Pi(m) = \Pi(0)P^m$$

where $\Pi(0)$ is the vector containing the initial probabilities of being in each state at time 0.

Long-Run Behavior of Markov Chains

As the time index m approaches infinity, a Markov chain may settle down and exhibit steady-state behavior. If the following limit exists:

$$\lim_{m \rightarrow \infty} p_{ij}^{(m)} = \pi_j$$

for all values of i , then the $\{\pi_j\}$ are the limiting or steady-state probabilities.

Looking at the state probability as m approaches infinity, we see that:

$$\begin{aligned} \lim_{m \rightarrow \infty} \pi_j(m) &= \lim_{m \rightarrow \infty} \sum_i \pi_i(0) p_{ij}(m) \\ &= \sum_i \pi_i(0) \lim_{m \rightarrow \infty} p_{ij}(m) \\ &= \sum_i \pi_i(0) \pi_j \\ &= \pi_j \sum_i \pi_i(0) \\ &= \pi_j \end{aligned} \tag{1}$$

When the limiting probabilities exist, they can be found using the following equations:

$$\Pi = \Pi P$$

and

$$\sum_i \pi_i = 1$$

where

$$\Pi = \left[\pi_0 \quad \pi_1 \quad \pi_2 \quad \cdots \right]$$