South Carolina Food Stamp and Well-Being Study

Transitions in Food Stamp and TANF Participation and Employment Among Families With Children

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Abstract

People who receive public assistance confront a number of "clocks" that may affect program participation. Examples of clocks include time limits on receiving benefits and recurring deadlines for reconfirming eligibility. This study examines the role of program clocks, economic conditions, and other circumstances on participation in South Carolina's cash and food assistance programs. Families in South Carolina's Temporary Assistance for Needy Families (TANF) program are restricted to 2 years of benefits in any 10-year period. Caseworkers set intervals between redetermining TANF eligibility but cannot make them longer than a year. Families in the State's Food Stamp Program (FSP) are required to recertify their eligibility at regular intervals. The study shows that South Carolina's 2-year time limit hastens exits from and reduces returns to the TANF program and that the State's policy of quarterly recertifications hastened exits from the FSP. In addition, annual redeterminations may contribute to TANF exits. Finding employment speeds exits from the FSP and cash assistance and delays returns to the programs. Cash assistance participation may lead to longer spells of receiving food stamps.

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Summary

People who receive public assistance confront a number of "clocks" associated with their continued participation. Examples of these clocks include time limits on benefit receipt and recurring deadlines for reconfirming eligibility. Researchers and program officials are aware that these clocks may directly and indirectly affect program participation. However, efforts to confirm and quantify their effects have been hampered by the lack of suitable data. This paper uses administrative records and event history methods to examine the role of program clocks, economic conditions and other circumstances on participation in South Carolina's cash and food assistance programs.

Characteristics of the state's programs provide superb foundations for investigating clock effects. The time limit in South Carolina's Temporary Assistance for Needy Families (TANF) program is much shorter than in most other states—families are generally restricted to two years of benefit receipt in any ten-year period. South Carolinians began exhausting their eligibility as early as 1998 providing numerous cases and a reasonably long history to study. In administering the Food Stamp Program, the state required families to recertify their eligibility at regular intervals—quarterly or annually before October 2002 and semi-annually or annually afterwards. Because recertification dates are set relative to the start dates of participation spells and because the intervals changed over time, they can be easily distinguished from seasonal effects and other calendar effects. The procedures for redetermining TANF eligibility are less uniform; caseworkers have discretion in setting the intervals between redeterminations but cannot make them longer than a year. Because caseworkers often adopt one-year intervals, it is possible to detect impacts of redetermination.

The paper jointly estimates continuous-time event history (hazard) models of exit from and entry into food stamps, event history models of exit from and entry into TANF, and discrete-time binary choice models of employment. Along with controls for program clocks, the transitions into and from food stamps are specified to depend on employment and TANF participation, while the transitions involving TANF are specified to depend on employment. The models also allow for repeated spells of program participation and non-participation and control for problems of omitted variables and endogeneity.

The resulting empirical analyses provide strong evidence that South Carolina's two-year time limit hastens exits from and decreases returns to its TANF program and that the state's initial policy of quarterly recertifications hastened exits from the Food Stamp Program. There is also evidence that annual redeterminations contribute to TANF exits. Model estimates further indicate that employment speeds exits from food stamps and cash assistance and delays returns to these programs. Finally, there is evidence that participation in cash assistance leads to longer spells of food stamp receipt.

South Carolina Food Stamp and Well-Being Study: Transitions in Food Stamp and TANF Participation and Employment Among Families With Children

1. Introduction

States and the federal government dramatically reformed public assistance programs in the 1990s. States began the process by altering portions of their Aid to Families with Dependent Children (AFDC) programs through waivers to the programs. In 1996, the federal government undertook a more comprehensive reform by enacting the Personal Responsibility and Work Opportunities Reconciliation Act (PRWORA). The PRWORA replaced AFDC with the Temporary Assistance for Needy Families (TANF) program, switched the federal funding for cash assistance from matching grants to block grants, and ended entitlements to cash assistance.

One other crucial way in which the PRWORA departed from past policy was the five-year lifetime limit that it placed on eligibility for federally-subsidized welfare benefits. Although the time limit is often portrayed—and analyzed—as a uniform policy, states were actually given considerable discretion to alter the policy. They could relax the limits by exempting a portion of their caseloads or using their own funds to extend eligibility, or they could make the limits tougher by adopting shorter lifetime limits or imposing other types of limits. In either case, welfare recipients must now be mindful of the time that has run off their eligibility clocks. The time limits can lead to anticipatory effects wherein clients leave TANF prior to reaching the time limit in order to "bank" their eligibility and direct, mechanical effects when clients lose their eligibility upon reaching the time limit (Swann 2005).

Features of the Food Stamp Program also changed. The PRWORA reduced the generosity of the program by lowering the maximum benefits and ending the indexation of certain income disregards for inflation. It eliminated eligibility for most non-citizens and established new work requirements for able-bodied adults without dependents (ABAWDs). The federal government continues to fund the full cost of food stamp benefits, while the states administer the program.

An important administrative policy in the Food Stamp Program is the state's recertification interval. Formally, food stamp eligibility is determined on a monthly basis, and recipients are supposed to report changes in their eligibility immediately. However, there is no incentive to give this information, as the usual sanction for failing to report a change in eligibility is just the loss of benefits. To overcome this problem, states regularly require recipients to take the active steps of either completing paperwork or attending interviews to "recertify" their eligibility. The intervals between recertifications, which vary from a few months to a year or more, are set at the state's discretion and are another clock that affect caseloads. Short intervals reduce food stamp caseloads by quickly identifying ineligible recipients and by increasing the administrative burden for recipients.

Welfare and food stamp caseloads plummeted during the late 1990s. The number of people receiving cash welfare dropped from a peak of 14 million in 1994 to 6 million in 2000. Despite the subsequent economic downturn, the welfare caseload fell by an additional 800,000 people by 2002 (Committee on Ways and Means 2004). Over the same time period, the food stamp caseload fell from 28 million people in 1994 to 17 million in 2000 before rebounding to 21 million in 2003 (U.S. Department of Agriculture 2004). Different explanations have been offered for these trends, with different implications for people's well-being. On the one hand, improving economic conditions over the late 1990s meant that fewer people needed assistance and that well-being for these families increased. On the other hand, changes in rules and procedures likely moved some people off the welfare rolls who lacked independent means of support. Well-being would be diminished if benefits failed to reach otherwise needy families.

Clearly, it is important to understand how program behavior responds to economic and policy changes. However, previous studies have not had data sources and research designs that allowed them to look at both types of changes with the same level of scrutiny. Studies based on observational data have been able to investigate caseload behavior over different geographic areas and time periods. These studies have usually succeeded in measuring differences in economic conditions, such as unemployment rates, but not in measuring differences in policies, especially food stamp policies. Studies based on social experiments have had the opposite characteristics—excellent measures and designs to capture policy effects but little geographic or time series variation to capture economic effects.

In this study, we use administrative program records from the post-reform period in South Carolina to investigate how a number of policy, economic and demographic factors affected entry into and exit from food stamps and cash assistance. At first glance, our strategy of using administrative data from a single state would seem to offer only disadvantages as it limits the variability that we can consider in economic conditions and policies and restricts us to examining people who have been clients in the TANF or Food Stamp Programs. These limitations, however, need to be balanced against a number of strengths.

First and most importantly, the administrative data that we examine are extraordinarily detailed. They permit us to examine longitudinal family behavior, including the timing of transitions into and out of programs and the duration of program spells, while controlling for other family characteristics. The data are not subject to the recall and non-response problems that are common to surveys. They also include a large number of cases and are very recent, covering all of the post-reform period through the recent economic downturn.

Second, although the focus on a single state constrains the amount of economic and policy variation that we can consider, we are able to examine the available variation carefully and exploit its advantages. There are several features of the policy context in South Carolina that make it an excellent candidate for study. For one thing, the state's TANF program has a short time limit that restricts most families from receiving benefits for more than two years out of any ten. South Carolinians began reaching their time limits as early as 1998, which means that there are numerous cases and several years of follow-up data to study. Because we are using program records, we also have detailed information about families' participation histories and hence their use of months toward the limit. Data limitations have forced previous researchers to either

extrapolate results from pre-reform data (Gittleman 1999; Moffitt and Pavetti 2000; Swann 2005) or concentrate on the anticipatory effects of policies (Grogger 2002, 2003, 2004; Grogger and Michalopoulos 2003). Our analyses confirm earlier findings of anticipatory effects and provide new evidence regarding mechanical effects.

Also, until October 2002, South Carolina required food stamp recipients with variable incomes to recertify their eligibility every three months and recipients with fixed incomes to recertify every twelve months. After October 2002, the interval for recipients with variable incomes changed to six months. Because the recertification dates are tied to when a case begins, we can distinguish them from other calendar or seasonal effects. Our analysis of the data reveals that people are several times more likely to leave the Food Stamp Program at recertification dates than at other dates. Except for a study by Stavely et al. (2002), we are not aware of other studies that have linked the individual timing of recertifications to the timing of program exits.

We conduct descriptive analyses and estimate multivariate models of families' food stamp and cash assistance event histories. The descriptive analyses show how the probability of leaving food stamps and cash assistance varies over the course of a participation spell and especially how the probability rises as a family approaches a recertification or time limit date. The multivariate models examine these patterns while also accounting for other observed characteristics and circumstances of families, including their work behavior and local economic opportunities. In addition, the multivariate models account for statistical problems in event history analysis that arise with unobserved characteristics and endogenous explanatory variables.

The remainder of this paper is organized as follows. Section 2 describes food stamp and cash assistance policies and participation trends in South Carolina. Section 3 summarizes previous empirical studies of program dynamics, focusing on research that has considered food stamp participation and research specific to South Carolina. Section 4 describes the administrative data that are used in the study's empirical analysis. A descriptive analysis of food stamp and cash assistance program spells follows in Section 5. Section 6 describes the multivariate statistical procedures that we use to examine food stamp dynamics, cash assistance dynamics and employment. We report results from the multivariate models and several simulations based on the models in Section 7. Concluding remarks appear in Section 8.

2. Public Assistance in South Carolina

Characteristics of South Carolina's cash assistance and food stamp programs

Cash assistance. South Carolina's Family Independence (FI) Program, which was implemented in October 1996 as the state's TANF program, is one of the strictest, least generous and most work-oriented welfare programs in the country. While most states have adopted the federal five-year time limit on assistance, South Carolina imposes time limits of 24 months of participation in a ten-year period and five years in a lifetime. Full family sanctions have been instituted, as has a family cap provision disallowing benefits for children conceived while the parent receives TANF.

Recipients entering the FI program are required to complete an Individual Self-Sufficiency Plan and to engage in assisted job search. Over the period we are examining, benefits under the program were low; the maximum benefit for a family of three with no other income was $205 per month.[1] The earnings disregard and benefit reduction rate follow those of the old AFDC program. After the fourth month of employment, only the first $100 in monthly earnings is disregarded; beyond that, benefits are reduced by 32.4 cents for each additional dollar of income.[2] The meager benefit levels, low disregard, and high reduction rate mean that families lose their eligibility for cash assistance after earning just a small amount of money.

Participating families are required to meet with their caseworker periodically to review, or *redetermine*, their eligibility for FI. The caseworkers have some discretion in setting the dates for redetermination interviews; however, the first interview must take place within one year of beginning to receive benefits, and caseworkers often use the anniversary as the default date. Caseworkers are also supposed to schedule an interview in the 22nd month of an FI spell to review the family's progress toward achieving self-sufficiency and to remind the family that the two-year time limit is approaching.

The program does include some ameliorative features such as exemptions from the work requirements and time limits for disabled clients and people caring for disabled family members. The state eliminated the special work limits, work history requirement and 30-day waiting period

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[1] The maximum monthly TANF benefit for a family of three rose in fiscal year 2005 to $241.

[2] South Carolina calculates its FI benefits by comparing a family's needs to its countable income. The state sets needs at half of the federal poverty guideline; at the beginning of 2004, the need standard for a family of three was $635. A family in its first four months of employment would have half of its earnings disregarded from its countable income, while a family in later months of employment would have the first $100 disregarded. FI benefits would then be computed as 32.4 percent of the difference between needs and countable income.

for two-parent households that had been associated with the earlier AFDC-Unemployed Parent program. The state has also defined participation in work activities broadly to include certain training and education activities as well as treatment for problems such as substance abuse.[3] The program offers transitional Medicaid, child care, transportation, and relocation assistance to ease the movement from welfare to work. Unfortunately, the state spends only modest amounts on these supports, and families who voluntarily withdraw from FI or who fail to comply with the program's requirements are ineligible for them (however, sanctioned families who become employed after leaving the rolls can receive transitional assistance if they reapply for benefits).

Food stamps. As in other states, the Food Stamp Program in South Carolina is separate from the TANF program. Eligible families can participate in both programs, in either program alone, or in neither program. In 2003, only 9 percent of food stamp households in South Carolina received TANF; the comparable national figure was 17 percent (USDA 2004). Although the programs are separate, there are important interactions because food stamp benefits are conditioned on all of a household's income, including its TANF benefits. Food stamps have a nominal benefit reduction rate of 30 percent; however, there is also a work expense allowance under which 20 percent of earnings are disregarded. This makes the effective reduction rate 30 percent for unearned income and 24 percent for earned income, beyond a standard deduction.

In principle, food stamps can partly compensate for a loss of cash assistance; however, FI benefits in South Carolina are so low that a family with full FI benefits and no other income would already qualify for nearly the maximum food stamp allotment (the maximum monthly food stamp allotment for a family of three in 2004 was $371, and a family with the maximum FI benefit would have qualified for $349 in food stamps). Because of the higher maximum benefit and lower reduction rate, working families can receive food stamps even if they lose their eligibility for FI. Thus, food stamps end up complementing FI among current welfare recipients, supplementing the transitional assistance available to welfare leavers, and serving as a work support program for families who never qualify for FI.

Declining then rising caseloads

Caseload trends. Figure 1 shows the trends in the welfare and food stamp caseloads in South Carolina. The number of families receiving cash assistance in the state fell by nearly two-thirds between 1996 and 2000 from just under 50,000 families to 17,000 families, a sharper percentage decline than was seen nationally. The number of food stamp cases in the state also declined, though less precipitously, from 143,000 families in 1996 to 120,000 in 2000. Since 2000, the welfare and food stamp caseloads have increased. The welfare caseload grew modestly to 23,000 families by 2002. For food stamps, the rebound has been much more dramatic, surpassing the 1996 levels and climbing to over 200,000 families by the end of 2003.

Economic changes. Changes in economic circumstances undoubtedly account for some of change in caseloads. Shortly after the recession in the early 1990s, South Carolina's unemployment rate stood at 8 percent. By the end of 1996, the unemployment had fallen to 6 percent, and from the middle of 1997 until the end of 2000, it ranged between 3½ and 4½

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[3] Several of these features were implemented under a waiver to the federal TANF rules; the waiver expired in September 2003.

Figure 1. Trends in South Carolina Caseloads and Unemployment

South Carolina Food Stamp Caseload and Unemployment Rate

South Carolina AFDC/TANF Caseload and Unemployment Rate
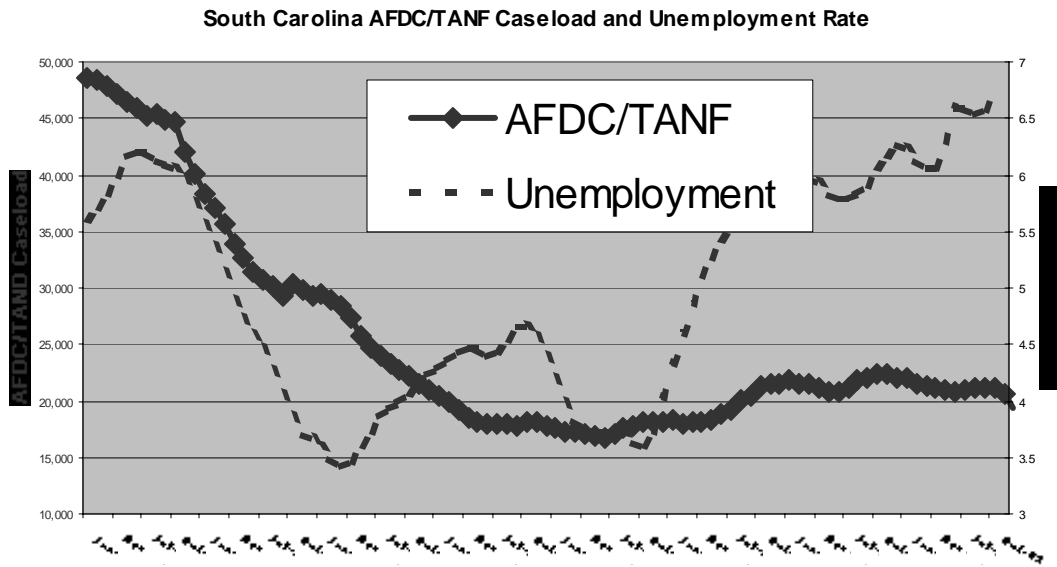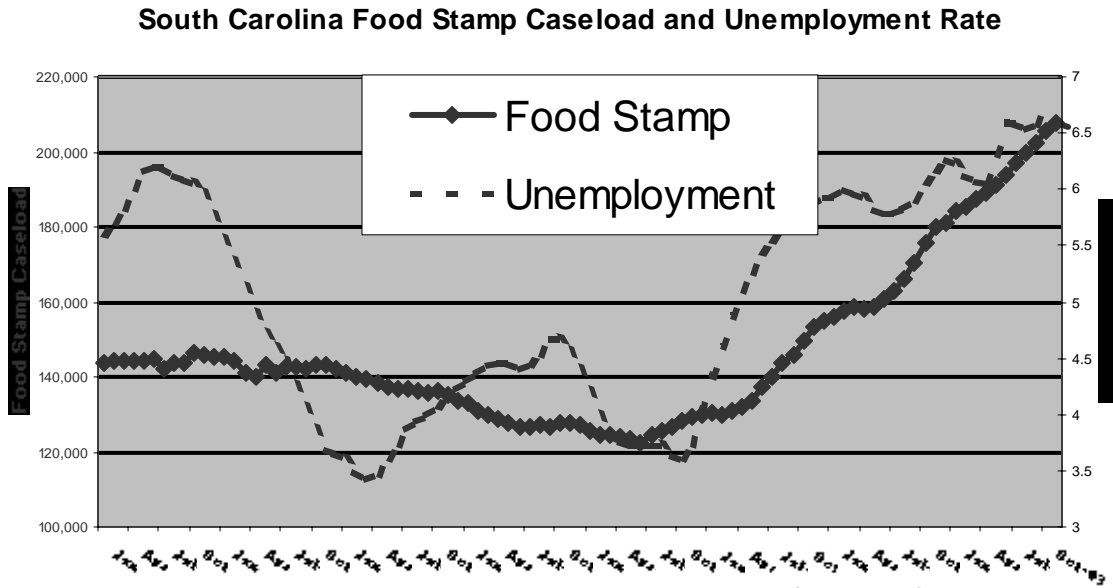
Note: Figures from the South Carolina Department of Social Services.

percent. In the second half of 2000 and the first half of 2001, the state and nation entered a brief recession, and unemployment rose. Although the recession ended in 2001, unemployment continued to climb, eventually reaching 6½ percent in 2003. As the figures indicate, monthly cash assistance caseloads track most of the decline in unemployment but only a small part of the rise, while food stamp caseloads track the rise in unemployment but not the fall. This incomplete tracking suggests that were other determinants of caseload dynamics besides cyclical conditions.

Policy changes. Program administrators in South Carolina attribute much of the decline in the state's cash assistance caseload to the restrictive policies and diversionary message of welfare reform. The South Carolina Legislative Audit Council (1998) found that three-fifths of the closures between the middle of 1996 and end of 1997 resulted from compliance failures, sanctions, and voluntary withdrawals, rather than people working their way off of welfare. Time limits have also become an important factor. TANF clients began reaching their 24-month time limits in October 1998; more than 6,000 families have had their cases closed for this reason. Time limits may be responsible for the dampened response of the cash assistance caseload to deteriorating economic circumstances in the last few years, as many families have lost eligibility and others may have opted to "bank" their benefits.

Food stamp policy changes. Policy factors also likely contributed to the changes in the food stamp caseload. On the one hand, a number of policy changes associated with the PRWORA legislation and the ways in which food stamps were administered in South Carolina may have led to declines in participation. On the other hand, active efforts by the state, especially since the late 1990s, to promote food stamp use among eligible clients may have led to increases. We discuss each of these changes in policy below.

The PRWORA eliminated food stamp eligibility for most non-citizens and imposed stringent work requirements on able-bodied adults without dependents. Non-working ABAWDs were limited to three months of food stamp participation in a 36-month period unless they lived in counties with a high unemployment rate or a "labor surplus." Subsequent executive orders and legislation lessened the restrictions on immigrants and ABAWDs.

An important administrative hurdle to food stamp receipt may have been the state's recertification policy. Until October 2002, the food stamp eligibility recertification period for households with earned income was quarterly. Although face-to-face interviews were only required once a year, mail-in recertifications were required every quarter. For clients with fixed incomes or no earnings, the recertification period was longer—effectively a year (elderly and disabled clients were formally allowed to certify for 24 months but received an interim contact at 12 months). The time required for face-to-face interviews and the paperwork hassles associated with even the mail-in procedure may have deterred participation, especially among working families who, in addition to facing frequent recertifications, also have less time because of their jobs. South Carolina subsequently changed its recertification policy. Since October 2002, families with fluctuating incomes are only required to recertify every six months; a larger number of recertification interviews can be conducted over the phone, and income verification procedures have been relaxed.

South Carolina has taken a number of other steps to encourage food stamp use among the needy. Some of these steps preceded the enactment of welfare reform. For instance, the state applied for and received a waiver from the USDA in 1992 that relaxed some of the reporting requirements for earned income. In 1995, the state created an aggressive outreach program for Supplemental Security Income recipients living alone.

Following the enactment of the PRWORA, South Carolina immediately applied for a waiver to exempt ABAWDs from work requirements in high unemployment and labor surplus counties; it later applied for exemptions for several other counties under the "15 percent rule." In the spring of 2000, the SCDSS instituted a broader emphasis on outreach to address the declining caseload. The program began with county outreach demonstrations using a workshop format, and promoted the use of USDA nutrition programs, brochures, and workshop guidance. Some of these projects involved contracted services with providers to conduct outreach activities, a social marketing campaign, grant funding for special outreach demonstration projects, and ongoing local outreach activities.

In April 2001, South Carolina opted to expand "categorical eligibility" under federal regulatory authority, which allows states to exclude consideration of assets, if income is at or below 180 percent of federal poverty guidelines and the household is receiving services from the state's TANF Program. Assets such as cars or homes no longer prevent families from receiving food stamps, nor are families required to liquidate bank accounts, if income has dropped below 180 percent of federal poverty guidelines. Food stamp participation rates in South Carolina have generally been above the national average since 1998 (Castner and Schirm 2004, Schirm 2001).

Summary of TANF and Food Stamp Policies in South Carolina

TANF Program: South Carolina Family Independence Program

- Implemented October 1996
- Low benefits: (approximately $205 for a family of three until FY 2005)
- "Work-first" approach that includes completing an Individual Self-Sufficiency Plan
- Earnings disregards and benefit reduction rate same as AFDC program
- Time limits: 24 months in 10 years, 5 years in a lifetime
- Redetermination of eligibility within one year on the program
- Full family sanctions
- Family cap – no benefits for children conceived while mothers were on TANF
- Eliminated AFDC-UP provisions for married households
- Exemptions for some clients, including the disabled and those caring for disabled family members

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Food Stamp Program

- Benefits conditioned on TANF benefits
- Recertification intervals:
  - Cases with fluctuating incomes: quarterly before October 2002 and semiannually thereafter
  - Cases with fixed incomes: annually before and after October 2002
- Work requirements and time limits for able-bodied adults without dependents; however, exemptions from these requirements in many counties
- Categorical eligibility for TANF families with incomes below 180% of poverty line
- Numerous outreach efforts

Implications for this Study

The foregoing discussion clearly indicates that TANF and food stamp caseloads, economic circumstances and policies have all changed within the state. The changes over time and across identifiable groups make South Carolina an excellent place to study how economic and policy conditions have affected transitions out of and back into programs.

The discussion also reminds us of the uniqueness of policies across states. South Carolina's policy climate includes a mix of accommodating and harsh elements. The state's welfare agency has made substantial efforts to encourage food stamp use and made other efforts to provide transitional assistance for families who leave welfare to work. At the same time, the state's strict policies, including its two-year time limit, have undoubtedly resulted in the loss of cash benefits for many disadvantaged people.

Finally, the discussion indicates that food stamps have become an increasingly important part of the social safety net in South Carolina, both in a relative sense as TANF cases and TANF

generosity have declined but also in an absolute sense as food stamp cases have grown. The state provides us with an opportunity to examine the impact of food stamp policies in an environment with fewer other means of redistribution and social insurance. The empirical analyses can give us insights into how food stamp caseloads might behave in other states if TANF caseloads continue to fall and TANF policies become more restrictive.

3. Review of Caseload Research

The advent of welfare reform and the unprecedented declines in assistance caseloads have prompted a torrent of research. Most of this research has focused on cash assistance caseloads; however, many studies have also examined food stamp caseloads. Studies have also been conducted specifically for the state of South Carolina. Because research on cash assistance caseloads has been comprehensively surveyed by Blank (2002), Bloom et al. (2002), Grogger et al. (2002), Moffitt (2002) and others, we only briefly summarize findings from the cash assistance studies conducted with national data. We provide a more comprehensive review of food stamp caseload studies and of the studies that have focused on South Carolina.

Cash assistance caseload research

Economic conditions. The observational studies of cash assistance caseloads have generally included controls, such as unemployment rates and wage rates, for economic conditions and have almost universally found that better conditions reduce caseloads. While there is solid evidence of an association between economic conditions and welfare caseloads, the magnitude of the relationship is disputed. Some estimates indicate that economic improvements accounted for less than one-tenth of the nation-wide caseload decline while others indicate that they accounted for two-thirds or more of the decline. Much of the research has relied on data that were collected prior to the recession in 2001. The limited response of cash assistance caseloads to the rise in unemployment since then suggests that the true effect lies near the lower range of estimates.

Benefit levels. Studies have also consistently found that reductions in benefit levels have discouraged welfare participation. The inflation-adjusted value of maximum cash assistance benefits has fallen in every state since 1970. If we just focus on the period since 1994, inflation-adjusted maximum AFDC/TANF payments have declined in 46 states. South Carolina, along with 24 other states, kept nominal benefit levels fixed over this period. Despite the low levels of inflation over the 1990s, the real value of benefits in South Carolina declined by about one-sixth. Most estimates of the elasticity of the caseload with respect to a change in benefits (the percentage change in caseloads associated with a percentage in benefits) fall in the range of 0.2 to 0.5. This implies that the reduction in real benefits in South Carolina would have contributed to a 3 to 8 percent decline in its welfare caseload.

Other policies. Other welfare policies also appear to have played a role in the caseload declines, though the findings here have been mixed. The strongest evidence regarding the effects of policies comes from the numerous experimental evaluations that were conducted of waiver policies. Grogger et al. (2002) summarized the evidence from more than two-dozen evaluations. They reported that the demonstrations that encouraged work by allowing welfare recipients to keep more of what they earn tended to increase participation. However, demonstrations that required recipients to engage in work-related activities or that set time limits generally reduced

participation. On the basis of this evidence, we would expect that South Carolina's FI reforms, which imposed both work requirements and time limits, trimmed the welfare caseload.

A limitation in the experimental evidence is that the demonstrations only included subsets of the policies that would appear in the later TANF programs. Observational studies of actual waiver and TANF policies have the potential to fill in the gaps in our knowledge. Unfortunately, many of the results from these studies have been statistically imprecise or counter-intuitive. The weak results reflect numerous methodological challenges that these studies face. First, states may choose their reform policies selectively based on the characteristics of their potential caseloads. Thus, caseloads may both affect and be affected by policies.[4] Second, the surfeit of policies and policy combinations across states makes it difficult to identify effects of specific policies. Summary measures, such as binary indicators for whether the state had implemented a waiver or a TANF reform, conflate policies that have different and possibly offsetting effects on the caseload. However, separate measures of specific policies run into problems of collinearity from the policies being implemented in a bundle and dilution from the policies only affecting segments of the population. Analyses of specific measures can be strengthened if the measures are examined among particular groups of people within each state; however, national data sets seldom have enough observations to form reliable estimates of groups in states with small or medium-sized populations. Thus, although some researchers have detected effects of policies, there are enough insignificant and contradictory estimates to leave these findings in dispute.

Time limits. An important subset of caseload research has explicitly considered the impacts of time limits. Several observational studies (Council of Economic Advisors 1997, 1999; Figlio and Ziliak 1999; Gittleman 2001; Ribar 2005; Schoeni and Blank 2000) have included a dummy variable indicator for the implementation of a time limit as one among several controls for AFDC waiver and TANF reforms. Results have varied with the estimated impacts of the time limit and other reforms being significant in some studies but not in others.

Several other studies have focused more narrowly on time limit policies. Some studies (e.g., Gittleman 1999; Moffitt and Pavetti 2000) have used pre-reform data on the distribution of welfare spells and calculated the percentage of spells that would have run longer than five years. The estimates from these studies do not account for anticipatory effects of time limits and other behavioral responses. Swann (2005) also used pre-reform data but estimated a dynamic structural model of marriage, employment and welfare use that incorporated forward-looking behavior. Simulations based on his model indicated that a five-year lifetime limit on welfare would reduce participation by 60 percent. Weaknesses in these studies are the absence of data on people's actual experiences with time limits and the inability to control for other elements of welfare reform.

Grogger and Michalopoulos (2003) and Grogger (2002, 2003, 2004) have examined post-reform data from several sources and used a clever statistical methodology to examine time limits. Their insight was that, regardless of any time limit, families lose their eligibility for welfare once their youngest child reaches age 18. Thus, time limits, when they are initially implemented, are only potentially binding on families with young children. The researchers

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[4] Grogger et al. (2002, p. 64) summarize an analysis by MaCurdy et al. (2000) that showed that changes that states made in their policies after 1992 were related to changes that occurred in caseloads prior to 1992.

compared outcomes for families with and without young children in programs with and without time limits and found that exposure to the time limit significantly reduced participation. At the time that their research was conducted, time limit policies had only been in place for a few years. So, the effects that were considered were anticipatory effects.

A natural question that arises in this research is whether families know what the relevant time limits are. Cherlin et al. (2000) interviewed current and former welfare recipients in three U.S. cities and found that most were aware that time limits existed and that many could correctly identify the limit. Knowledge of the policies was better in states with straightforward policies.

Food stamp caseload research

Although experiments and demonstrations have been used to evaluate a number of alternative food stamp policies, including implementing EBT systems, cashing out food stamp coupons, relaxing vehicle asset tests (Wemmerus and Gottlieb 1999) and providing special application procedures and benefit packages for the elderly clients (Cody 2004), the overwhelming majority of food stamp caseload research has relied on observational data. Accordingly, our review focuses on the observational studies.

Sources of observational data. Observational data for food stamp research have been drawn from both surveys and administrative sources. Bartlett et al. (2004), Blank and Ruggles (1996), Farrell et al. (2003), Fraker and Moffitt (1988), Gleason et al. (1998a), Haider et al. (2003), Keane and Moffitt (1998), McKernan and Ratcliffe (2003), and Mills et al. (2001) examined survey data, while Kabbani and Wilde (2003), Kornfeld (2002), Staveley et al. (2002), Wallace and Blank (1999), and Ziliak et al. (2003) considered administrative data. Currie and Grogger (2001) analyzed both types of data.

The primary advantage of survey sources, such as the Current Population Survey (CPS) and Survey of Income and Program Participation (SIPP), is that they collect information for program participants and non-participants. In contrast, administrative data are generally confined to participants, though they sometimes also include applicants and former participants. Thus, survey data are less selective than administrative data and can be used to consider program take-up and participation generally. A second advantage of survey data is that they typically include rich sets of demographic and economic descriptors. Administrative systems often only contain measures needed to determine eligibility or benefits.

A shortcoming, however, of survey data is that they rely on self-reports of program participation, which can be inaccurate. In retrospective surveys, people sometimes have trouble recalling the exact dates when they began or stopped receiving benefits. In panel surveys with a retrospective component, this can lead to "seam" problems where transitions spuriously appear to be more likely at interview dates (the seams between the panels) than at other dates.

Even in surveys with short recall periods, people can make reporting errors. Bollinger and David (2001) compared responses from the 1984 panel of the SIPP, which used a four-month recall period, with administrative data and found that 12.2 percent of food stamp participants incorrectly reported that they were not participants while 0.3 percent of nonparticipants incorrectly reported that they were participants. Net underreporting in the March

files of the CPS, which use a 15-month recall period, appears to be even larger. Problems of item non-response can also arise when people refuse or fail to answer questions.

Another difficulty with national surveys is that they rarely have large enough samples to examine conditions within small and medium sized states. This is a problem for analyses of individual states and when only a few states implement a particular policy. Public-use files from the CPS, SIPP and other national surveys also suppress detailed geographic identifiers to preserve the respondents' confidentiality. Without geographic identifiers, the observations in the survey cannot be linked to information on local economic, social and program circumstances.

Organization of data. The observational studies have also differed in the organization of their data. Currie and Grogger (2001), Kabbani and Wilde (2003), Kornfeld (2002), Wallace and Blank (1999) and Ziliak et al. (2003) examined aggregate, state-level caseload outcomes, while Bartlett et al. (2004), Fraker and Moffitt (1988), Farrell et al. (2003), Haider et al. (2003) and Keane and Moffitt (1998) considered individual participation outcomes from cross-section or repeated cross-section data. Several of the analyses in the study by Currie and Grogger (2001) also used repeated cross-section, household data. Finally, the studies by Blank and Ruggles (1996), Gleason et al. (1998a), McKernan and Ratcliffe (2003), Mills et al. (2001), and Staveley et al. (2002) examined individual event histories of food stamp participation.

Individual-level data can be used to control for numerous personal and household characteristics. Most of the individual-level studies have incorporated measures for demographic characteristics like gender, race/ethnicity, age, education, marital status and household composition as explanatory variables. The aggregate studies have either examined the food stamp caseload as a whole (e.g., Wallace and Blank 1999, Ziliak et al. 2003) or considered broad subsets of the population such as working and non-working families (Kabbani and Wilde 2003), rural and urban families (Currie and Grogger 2001), and married and unmarried families with and without children (Currie and Grogger, 2001, Kornfeld (2002). Controlling for relevant demographic characteristics leads to more precise statistical results. Controlling for these characteristics can also reduce statistical biases, if the characteristics are correlated with economic conditions and public policies. This could happen if certain groups, such as blacks, are more likely to live in disadvantaged areas or in states with restrictive policies.

Most of the observational studies have been limited in one way or another in the types of contextual measures that they have examined. The aggregate state-level caseload studies were not able to look at economic or policy conditions for sub-state areas. Most of the individual-level studies used national surveys that lacked detailed geographic identifiers. The studies by Blank and Ruggles (1996), Farrell et al. (2003), Fraker and Moffitt (1988), Gleason et al. (1998a), Keane and Moffitt (1998) and McKernan and Ratcliffe (2003), which examined data from the SIPP, could not even identify all states. The analysis by Staveley et al. (2002) did identify separate counties; however, it did not include any contextual variables.

Economic conditions. Nearly all of the studies have reported that food stamp participation falls as personal and local economic circumstances improve. Most of the aggregate studies have used state-level unemployment rates as measures of economic conditions and found that unemployment is strongly, positively associated with caseloads. For instance, Wallace and

Blank (1999) calculated that a one percent increase in the unemployment rate would lead to a 6.8 percent increase in the proportion of people receiving food stamps over a three-year period.

The individual-level studies have looked more directly at whether people work and how much people earn. McKernan and Ratcliffe (2003) estimated that families in which all of the adults worked were less than half as likely to participate in food stamps as families in which no one worked. Farrell et al. (2003) found that food stamp participation among eligible families initially rose with income (up to 25 to 35 percent of the poverty line) then fell thereafter. They reported that participation rates for eligible families at 25-35 percent of the poverty line were twice as high as participation rates for eligible families close to the poverty line.

Policies. Fewer studies have directly examined food stamp policies. The studies by Farrell et al. (2003), Gleason et al. (1998a), Mills et al. (2001), Staveley et al. (2002), and Wallace and Blank (1999) included no policy measures whatsoever. The studies by Fraker and Moffitt (1988), Haider et al. (2003), and Keane and Moffitt (1998) only included measures for the benefit formula. Fraker and Moffitt (1988) and Keane and Moffitt (1998) examined single mother families and found that higher benefits encouraged participation; each of these studies used structural econometric methods that accounted for self-selection from employment and other program participation decisions. Haider et al. (2003) examined people aged 50 and over and found that food stamp benefits were negatively associated with program participation; they did not account for the endogeneity of benefits and attributed their counter-intuitive findings to the measured variation in benefits being driven by large medical and shelter costs.

Recertification intervals. Of particular relevance for our investigation, several studies have examined state recertification policies. Kabbani and Wilde (2003) estimated that changes from annual to quarterly recertification periods across states in the late 1990s could explain as much as ten percent of the caseload decline. Their results accord with some of the estimates reported by Currie and Grogger (2001), who found that food stamp participation among low-income households with children was positively associated with the average recertification interval in the state of residence. They also reported that recertification intervals were a significant factor in the participation of low-income rural households but not a significant factor for households without children and urban households. McKernan and Ratcliffe (2003) found that the proportion of working households subject to 4-6 month recertifications was significantly negatively related to food stamp participation.

Staveley et al. (2002) examined the duration of food stamp spells and found that spells were more likely to end in months that coincided with probable recertification dates than in other months. In contrast to these studies, the U.S. General Accounting Office (1999) surveyed state Food Stamp Program directors to get their impressions of the reasons for the large decline in food stamp caseloads following the enactment of the PRWORA. Most of the directors in the GAO study cited improvements in the economy, changes in eligibility associated with the PRWORA, and changes in state policies and procedures as important factors in the decline. None of the directors, however, felt that changes in recertification procedures played a major role, and only a handful felt that recertification played even a moderate role.

ABAWD restrictions. Ziliak et al. (2003) examined the proportion of ABAWDs who lived in counties with waivers from the PRWORA food stamp work requirements. They found

that a one percent increase in the proportion of ABAWDs who were exempt from the requirements increased aggregate food stamp participation by a small but statistically significant 0.05 percent.

EBT implementation. Several studies have incorporated indicators for whether a state implemented an Electronic Benefits Transfer system. Kabbani and Wilde (2003) and Kornfeld (2002) found that EBT systems encouraged participation. However, Currie and Grogger (2001) obtained mixed results—EBT implementation was associated with greater participation for some groups but lower participation for others. Most of their estimates were not statistically distinguishable from zero. McKernan and Ratcliffe (2003) found that EBT implementation had a weak negative relationship with participation for low-income, working age adults.

Administrative policies. Several studies have used an indirect measure—the state's error rate in determining food stamp eligibility and benefits—as an indicator, or proxy variable, for lax state administrative policies. Kabbani and Wilde (2003) and Kornfeld (2002) found that error rates were significantly, positively associated with caseload levels, while Ziliak et al. (2003) found that error rates had virtually no association with caseloads.

In contrast to these studies, Bartlett et al. (2003) gathered detailed, direct information on administrative policies, such as outreach efforts and operating hours, and administrator and staff attitudes across food stamp offices in different localities. Bartlett et al. found that these administrative characteristics influenced participation behavior.

TANF implementation. Currie and Grogger (2001), Kabbani and Wilde (2003), Kornfeld (2002) and Ziliak et al. (2003) included indicators for the implementation of TANF policies. Currie and Grogger (2001) found that food stamp participation was lower in states after they implemented TANF; however, Kabbani and Wilde (2003) and Ziliak et al. (2003) found no significant associations. Kornfeld (2002) found that several specific TANF policies, most notably strict benefit sanctions, contributed to the decline in food stamp caseloads. The estimated impact of cash assistance policies appears to be sensitive to whether the study controlled for actual welfare participation.

Comparing economic and policy changes. Summarizing the effects from several different variables, Kornfeld (2002) concluded that economic changes accounted for about 20 percent of the food stamp caseload decline, direct restrictions on eligibility for immigrants and non-working ABAWDs accounted for another 10 percent, while other changes in TANF policies accounted for just over 20 percent. Currie and Grogger (2001) came to a similar conclusion that the economy was responsible for 20 percent of the food stamp caseload decline while policies were responsible for 30 percent. Wallace and Blank (1999) assigned a larger role to the economy (28 to 44 percent) and a smaller role to welfare reform (6 percent); however, their analysis, which only examined data through 1996, included no direct indicators for food stamp policies. Similarly, Ziliak et al. (2003) concluded that economic changes were important.

The USDA (2001) has also examined the literature on the food stamp caseload decline. It found that just under half of the decline occurred because of changes in eligibility. Specifically, the USDA concluded that 35 percent of the decline occurred because higher incomes reduced eligibility while 8 percent of the decline occurred because program rules limited eligibility. The

USDA found that the remainder of the decline occurred among people who remained eligible for food stamps but did not participate in the program. Many of these people were former welfare recipients who were either incorrectly denied benefits or confused about their eligibility.

Research on South Carolina

Initial SCDSS surveys. Within South Carolina, the high sanctioning rates of FI clients in the first few years of welfare reform, the ineligibility of sanctioned clients to receive transitional assistance, and the low take-up rates of food stamps among welfare leavers led to concerns about their well-being. Acting on these concerns, the SCDSS administrator in charge of the FI program, Dr. William Middleton, commissioned some of the agency's staff to design and implement surveys of former welfare clients. These were the first "leaver studies" in the country, and the instrument became a prototype for subsequent leaver surveys across the country.

In the surveys, representative samples of leavers from the first eight quarters of the FI program, October 1996 through September 1998, were interviewed about their job status, household economic circumstances, family well-being and deprivations. The surveys also asked about their receipt of transitional benefits as well as other income supports for which they were eligible post-welfare, such as food stamps. Early surveys showed that many former clients were unaware that they remained eligible for food stamps.

Educational campaigns were initiated by the SCDSS, and awareness of food stamps improved from 75 percent in the first quarterly survey to 83 percent in the eighth. Nevertheless, the take-up rate on post-welfare food stamps did not improve. For welfare leavers who were not working, the food stamp participation rate fell from 72 percent among the first cohort of leavers to 61 percent in later cohorts. For welfare leavers who were working, the food stamp participation rate fell from 61 percent in the initial cohort to 55 percent in later cohorts.

DHHS-funded surveys. The Administration for Children and Families and the Assistant Secretary for Planning and Evaluation in the U.S. Department of Health and Human Services funded a three-year longitudinal study of families who left welfare in South Carolina between October 1998 and March 1999. The goals of the study were very similar to those of the earlier SCDSS surveys—to assess family economic circumstances, employment and benefit use post-welfare, as well as family well-being and deprivations. The sample was stratified by closure reasons (e.g., left because of earnings, sanctions, time limits, etc.) so that the well-being and other implications of different types of departures could be understood.

Approximately 55 percent of leavers in the DHHS-funded surveys stayed off welfare and worked some or most of the time, over the three years. Better educated leavers and those who left for earned income worked more often. The percentage of leavers in food stamp households rose from 58 to nearly 62 percent over the course of the study. Increased awareness of benefits may be an explanation, but the recession beginning in 2000 may also have been responsible. Over 75 percent of currently unemployed leavers were living in households receiving food stamps compared to over 50 percent of employed leavers.

Interviews showed that two-thirds of sanctioned leavers and five-sixths of time-limited leavers were receiving food stamps in round three of the interviews, suggesting that these

vulnerable subgroups were aware of available benefits. Approximately half of those who left for earned income were receiving food stamps; 70 percent of those who left for earned income and who were no longer receiving food stamps said that they had been told they were no longer eligible, and only nine percent said they no longer needed food stamps.

Food stamp leaver surveys. In 1998, the Economic Research Service of the USDA awarded a grant to South Carolina to study "non-TANF" families and ABAWDs who had left the Food Stamp Program. Non-TANF families were defined as families who had not received TANF in the 12 months prior to sample selection. National data for 1997 showed that about one fifth of all food stamp cases involved non-TANF families. For each group, interviews were conducted with two cohorts of food stamp leavers, the first from 1998-1999 and the second from 1999-2000 (Richardson et al. 2003a, b). Interviews were conducted about a year after the families and ABAWDs left the rolls.

The recidivism rate in the surveys was nearly 30 percent; younger recipients with less education were most likely to re-enroll. Over 80 percent of the recipients who stayed off food stamps were either working or living with someone who worked. The highest rate of employment post-food stamps (89 percent) was for those with some college; the corresponding employment rates for high school graduates and drop-outs were 80 and 58 percent, respectively. Among respondents who were not employed and were still off food stamps, over 30 percent cited a health problem as the reason for not working.

A major finding of this study was that about a quarter of the respondents who were not receiving food stamps at the time of interview cited pride and dignity, administrative hassles, difficulty fulfilling paperwork requirements, or a combination of these as reasons for not participating. Two-thirds of this group appeared to qualify for benefits.

Other research. Research indicated that the FI reform was "working" for many clients. As discussed by Edelhoch (1999), the leaver surveys showed that most leavers had avoided the calamitous deprivations predicted by some policy analysts and welfare advocates at the inception of reform. Edelhoch's study and others, including those of the South Carolina Legislative Audit Council (1998) and Pindus and Koralek (2000), found that half to two-thirds of clients were employed immediately or shortly after their spell on cash assistance.

Even when research focused on relatively disadvantaged clients, employment rates were high. Edelhoch et al. (2000) used survey data to examine leavers who initially appeared not to be working on the basis of Unemployment Insurance records and found that more than a third were in fact working, just not in covered employment. In a subsequent study, the same researchers (2001) examined employment among sanctioned FI clients and found that a third were working in the quarter after leaving welfare and nearly half were working two years after leaving welfare. Similarly, Edelhoch et al. (2002) found only modest differences in employment between easy- and hard-to-move clients.

That said, a substantial minority of welfare leavers have not made successful transitions. The flip side to one-half to two-thirds of leavers working is that one-third to one-half do not. Edelhoch and her colleagues have consistently found that a non-negligible fraction of leavers confront problems buying food, paying for utilities, and keeping their residences.

4. Analysis Data

The primary data for the empirical analyses come from two administrative systems maintained by the state of South Carolina: case management records from the state's food stamp and FI programs and earnings records from the its Unemployment Insurance program. We draw records from each system covering the period from October 1996 until December 2003 and examine variable-length spells of program participation and quarterly periods of employment.

Spell data. The units of analysis for the models of program participation and non-participation are spells. A spell refers to the length of time that a family spends in one situation, such as participating in the Food Stamp Program, before leaving that situation. Spells are demarked by start and end dates and are also described in terms of their durations. We consider four types of spells corresponding to participation and non-participation in each of two assistance programs: food stamps and FI. Families can experience multiple and repeated spells. Within a program, spells of participation and non-participation follow one another and do not overlap. Across programs, the start and end dates of spells may overlap. For instance, within a spell of food stamp participation, a family might finish a spell of FI non-participation and begin a spell of FI participation. A myriad of other overlapping sequences are also possible across programs.

While spells all necessarily begin and end at some time, we do not always observe these times in the data. Spell records can be complete, right-censored, or left-censored. As the designation implies, complete spell records contain both the start and end dates of spells and provide exact information on the spell duration. Right-censored spells are those for which the ending date is missing. Because these observations are followed up to some date but not after, we know that the spell was at least as long as the measured duration. In this study, spells that were ongoing on December 31, 2003 are right-censored. The hazard models used in the multivariate statistical analysis address the loss of information associated with right-censoring. Left-censored spells are those for which the start date is missing; spells that were ongoing as of October 1, 1996 are left-censored. As with right-censored spells, the durations of left-censored spells are longer than what is observed. Unlike right-censoring though, it is relatively difficult to account for left-censoring in a multivariate analysis with time-varying explanatory variables. Consequently, left-censored program participation spells are dropped from the analysis.

Spells should refer to continuous periods of participation or non-participation. However, the administrative records contain numerous instances of breaks and short spells. In processing the data for each family, the study smoothes the information by combining spells of program participation that are separated by a month or less and ignoring spells of participation that last a month or less. This kind of smoothing is commonly applied in studies of caseload dynamics and can be interpreted as reflecting reasonably strong attachment or detachment from a program.

Quarterly employment data. The assistance program records designate one person as the "primary informant" for the family. The primary informant is the person responsible for the family's financial decisions and in a position to provide information for its members. The study extracts data from the assistance program records on this person's age, gender, race, educational

attainment, and marital status and uses these as explanatory variables. It also extracts quarterly records on the person's earnings from the state's UI database.

The UI database contains earnings records for most private, non-agricultural employers. The Bureau of Labor Statistics estimates that UI-covered jobs account for 98 percent of all private employment in the country.[5] Even so, the database still overlooks government employment and some types of private-sector jobs, such as agricultural and domestic work, that may be relevant for welfare and food stamp recipients. It also misses employment by people who commute out of the state to work. As mentioned, Edelhoch et al. (2001) found that nearly a third of welfare leavers who appeared not be working on the basis of UI records were actually employed in some capacity. Edin and Lein (1997) similarly found that many welfare mothers work in uncovered or underground jobs.

For the primary informant in each family, we sum his or her earnings from all jobs reported in a given quarter and create an indicator for whether the earnings exceeded $250. The figures for different years are adjusted to constant 2003 dollars using the Consumer Price Index for Urban Workers. The $250 threshold was selected after some experimentation. It is approximately the amount that a minimum-wage employee would earn working one week at a full-time job. For our analyses, we consider discrete, quarter-by-quarter realizations of the earnings/employment indicator. Because an overwhelming number of earnings histories are left-censored at the start of the observation window and because spells of joblessness could easily be masked within or across quarters, we do not examine durations of employment.

Other variables. From the information available for the primary informants, we construct separate indicators for whether the person was female or black. To describe the informant's educational attainment, we also construct two mutually exclusive indicators for whether the person completed high school but did not go on to college or whether the person completed at least some college; the excluded category consists of those who did not complete high school. For marital status and marital history, we include two mutually exclusive indicators for whether the primary informant is currently or formerly married; the omitted category is never married. The study also records the informant's age at the start of a spell and the number of children in different age groups—0-2, 3-5, 6-11, 12-14 and 15-17.

In the empirical analysis, family composition variables that directly affect eligibility and the level of benefits are recorded as of the beginning of a spell and not updated within a spell. This is done to avoid possible endogeneity problems associated with changes in family structure. The time-varying measures that describe the primary informant's education are updated within spells each time a new spell of another type of program participation begins. For example, education information in the middle of a food stamp participation spell would be updated if the family entered the FI program during that time.

We use information on the family's county of residence to link the administrative records to a set of economic, demographic, geographic and policy measures. In particular, we use quarterly measures of the county unemployment rate as indicators of economic opportunities.

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[5] "State and County Employment and Wages from Covered Employment and Wages," <http://www.bls.gov/cew/>, accessed Nov. 26, 2003.

We use the population density – the number of people per square mile in the county of residence – to capture the degree of urbanization and development. As a partial control for missed coverage in the UI employment variable, we include an indicator for counties along the state's border. As a policy measure, we include a time-varying indicator for whether ABAWDs in the county of residence were exempt from the PRWORA work requirements under the high unemployment, labor surplus area, or 15-percent waiver rules. In the empirical analyses, the time-varying county-level measures are updated within spells.

Sample inclusions. To construct our analysis sample, we start with a universe of families who began one or more spells of food stamp or FI participation between October 1, 1996 and December 31, 2003. Because we wish to study transitions in and interactions between the Food Stamp and FI programs, we limit the analysis to families that were ever observed with a child under the age of 18 (childless families would not have been eligible to participate in the FI program). In 2003, 59 percent of the households on food stamps in South Carolina were households with children (USDA 2004). In a separate analysis (Ribar et al. 2005a), we examine food stamp transitions and employment among childless households.

To reduce problems with left-censoring, the initial participation spell had to involve a transition from not participating in either food stamps or FI to participating in one or both of the programs. Thus, our analysis extract excludes spells of participation that were ongoing on October 1, 1996. While the extract is representative of all spells that began over the 7¼-year period, it is not representative of all spells that might be observed over that period. In particular, it disproportionately excludes long spells. On the whole, however, the loss in representativeness is minimal as the extract includes records for roughly five-sixths of families who were ever program participants over the observation period.

Because we jointly examine sequences of participation and non-participation in two programs, we cannot avoid left-censoring altogether. We left-censor one initial spell of non-participation for most of the families. Consider a family who began a spell of food stamp participation but not FI participation sometime after October 1, 1996. The family's event history would begin with a food stamp participation spell that is not left-censored and an FI non-participation spell that is artificially left-censored at the point where the food stamp participation spell began. Similarly, a family who initially transitioned into FI would begin with a non-left-censored spell for participation in that program but a left-censored spell for non-participation in food stamps. Here too, the non-participation spell would be artificially censored at the point where the other program's participation spell begins. The only families without any left-censored records are those whose initial transitions involved entering the food stamp and FI programs at the same time.

Extracting information for all families with new participation spells produces records for over 250,000 families—far too many to analyze. To reduce the size of the analysis file, we use a sampling approach. We extract records for all families with new spells who had already been selected for inclusion in the five food stamp and FI leaver surveys conducted by Maximus, Inc. and the state of South Carolina.[6] We then supplement these with records for one out of every 11

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[6] A companion analysis that we have conducted (Ribar et al. 2005b) uses the survey data to examine food security and other material well-being outcomes among food stamp and FI leavers.

remaining families. The statistical analyses weight the observations to reflect these different sampling rates.

We drop a small number of additional observations with (a) inconsistent spell information, (b) missing demographic information, (c) primary informants who change over time, (d) primary informants who are younger than 15 or older than 85 years of age when they were first observed participating in a program, and (e) primary informants who were never older than 17 years of age during the period that they were observed. These exclusions result in the loss of just over three percent of the sample. The final analysis extract contains information for 25,307 families and includes 46,529 food stamp participation spells, 35,915 food stamp non-participation spells, 14,095 FI participation spells, and 32,611 FI non-participation spells. It also includes 442,965 quarterly employment observations. On average, each case was followed for just over four years, experienced 1.8 spells of food stamp participation, experienced 0.6 spells of FI participation, and held a covered job 46 percent of the time.

In the multivariate empirical analyses, we separately examine 19,305 families whose primary informants were never observed to be married and 6,002 families whose primary informants were ever observed to be married. Although South Carolina eliminated the statutory distinctions between one- and two-parent families in its cash assistance program, behavior is likely to differ between single-parent and married-couple families. Appendix A lists the means of the variables in the analysis separately for the unmarried and ever-married groups. Means for the time-varying measures are computed from the quarterly employment observations, which span the observation period for each case.

The descriptive statistics show that the primary informants who were continuously unmarried were younger, more likely to be women, more likely to be black, and had fewer children than the primary informants who were married at some point in the observation period. The continuously unmarried group also spent a higher proportion of its time receiving food stamps and cash benefits than the ever-married group. Interestingly, however, the unmarried primary informants were more likely to work than their ever-married counterparts.

5. Descriptive Analysis of Spell Data

Figure 2 displays nonparametric Kaplan-Meier estimates of the hazard and survival functions for spells of food stamp participation from the South Carolina administrative data. The hazards, which are probabilities of leaving the Food Stamp Program at different times during a participation spell conditional on having remained in the program up until those times, help us to characterize the duration dependence patterns in the spell data. The survival estimates, which are probabilities of spells lasting beyond given lengths of time, show the distribution of spell durations.[7] Although the administrative source data for the spells are recorded to a daily level, the estimates in Figure 2 are calculated using periods that correspond to a fifth of a month, or roughly a six-day period. This smoothes the estimates and reduces the number of computations (the multivariate analyses in the next section of the paper use the daily resolution). All of the estimates incorporate weights that adjust for the study's sampling methodology. Separate estimates are calculated for families who began their food stamp spells at different times.

The most striking feature of the estimated hazard functions is the pronounced saw-tooth pattern. All of the hazard functions exhibit sharp upward spikes at three-, six- or twelve-month intervals. The spikes coincide with the dates when the families would have been required to recertify their eligibility. The estimates indicate that families are much more likely to leave the Food Stamp Program in recertification months than in other months. For instance, the upper-most left panel displays the estimated hazard function for food stamp spells that began before 2000. Nearly all of these spells were subject to quarterly or annual recertification through their first 36 months, and consistent with this, we observe jumps in the hazard functions at three- and twelve-month intervals.

The upper right panel shows the hazard function for food stamp spells that began in the second half of 2000; these spells were subject to quarterly and annual recertification for their first 24 months and semi-annual and annual recertification thereafter. The recertification schedule is evident in the graph. Food stamp spells that began in the second half of 2001 were subject to quarterly and annual recertification for their first twelve months and semi-annual and annual recertification thereafter, while food stamp spells that began in or after the second half of 2002 were subject to semi-annual and annual recertification throughout their durations. The spikes in the graphs for these groups also line up with the relevant schedules.[8]

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[7] Hazard and survivor functions were originally developed to study mortality data. In a mortality analysis, hazard probabilities measure the chances of dying at a particular age conditional on living or *surviving* up until that age. Statisticians have continued to use the mortality terminology for these functions.
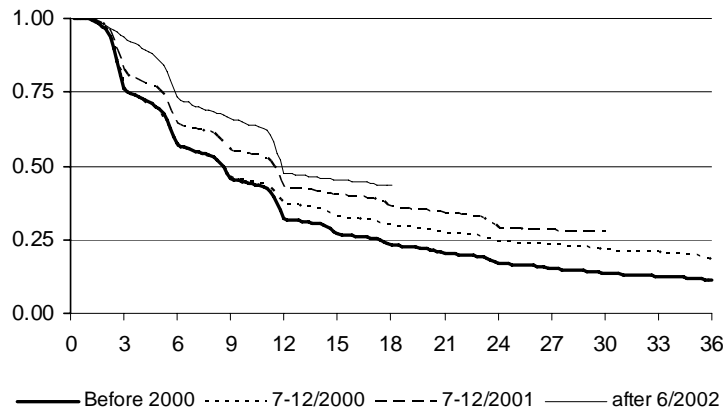[8] For brevity, the paper does not display results for food stamp spells that began in the first halves of 2000, 2001 and 2002. The hazard functions for these spells, however, also line up with the relevant recertification intervals.

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Figure 2. Nonparametric Event History Analysis of Food Stamp Program Exits for Different Entry Cohorts of Families with Children

a. Hazard Functions
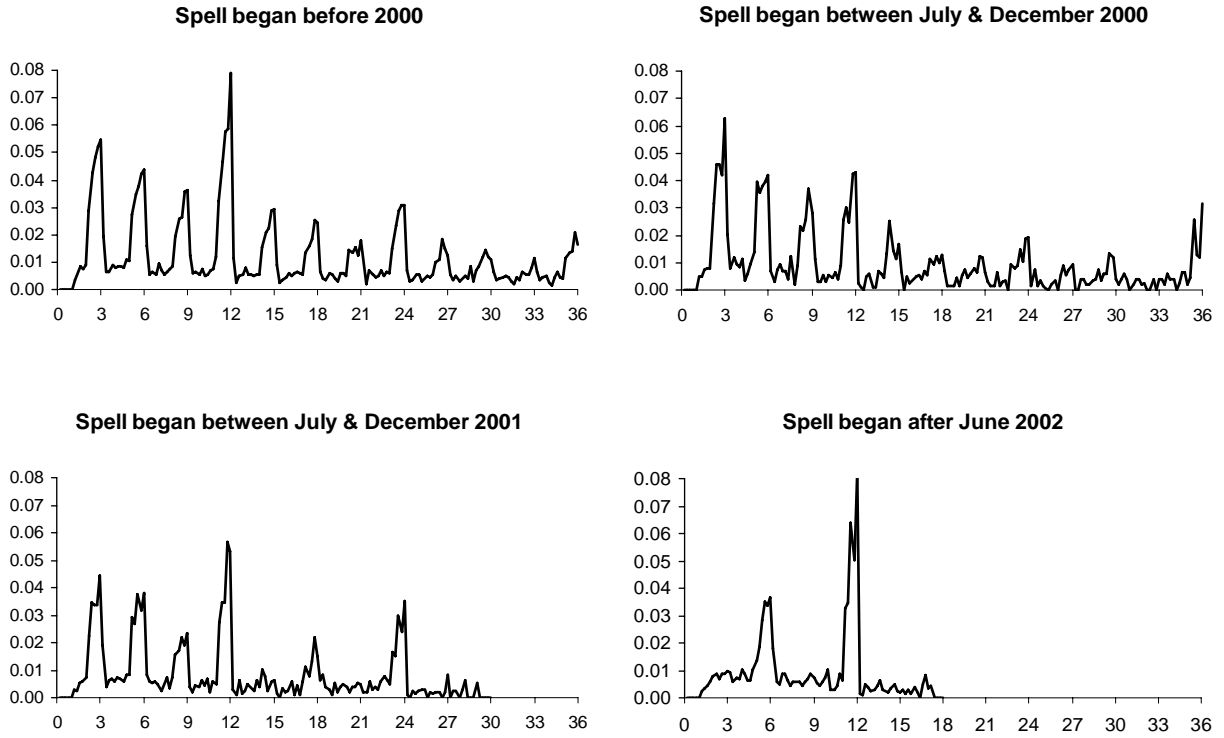
Spell began before 2000

Spell began between July & December 2000

Spell began between July & December 2001

Spell began after June 2002

b. Survival Functions

Before 2000 · · · · · · 7-12/2000 – – – – 7-12/2001 ——— after 6/2002

Note: Figures are Kaplan-Meier hazard and survival functions, calculated using 6-day frequencies. The figures are computed using weighted administrative data from the South Carolina Department of Social Services. Units for the vertical axes are probabilities, while the units for the horizontal axes are months.

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The bottom of Figure 2 shows the survival functions for the four groups. The large initial spikes in the hazard functions all lead to noticeable drops in the survival functions. For the first two cohorts of spells, roughly one-quarter ended within three months, with most of the exits actually occurring in the third month. Sizeable drops appear at other recertification periods.

The percentage of long spells clearly increased in successive cohorts. The median spell lengths (the lengths where exactly half the spells are longer and half are shorter) for the first two cohorts were just under nine months, while the median spell lengths for the latter two cohorts were closer to twelve months. Only a quarter of the spells that began before 2000 lasted 18 months or more, while 44 percent of spells that started after June 2002 reached this duration. The percentage of spells lasting two years or more rose from just under 20 percent in the first cohort to nearly 30 percent in the third cohort.

Figure 3 further disaggregates the spells by whether the program records initially indicated that the families had fluctuating or fixed incomes. Families with fluctuating incomes, usually earnings, were subject to quarterly or semi-annual recertification intervals, while families with fixed incomes were subject to annual intervals. Unfortunately, we were only able to obtain the relevant records on fixed versus fluctuating status going back to July 2001; so, Figure 3 only reports estimates for the last two spell cohorts from Figure 2. The top two panels show estimated hazard functions for spells that began in the second half of 2001, while the bottom two panels show estimated hazard functions for spells that began in or after the second half of 2002.

The graphs provide further evidence that the patterns in hazard functions represent the effects of recertification and not something else. The hazard functions for families who initially had fluctuating incomes have quarterly or semi-annual spikes in the first year, while the hazard functions for families with fixed incomes only have an annual spike in the first year. There is little discernable difference between the fluctuating and fixed income groups after twelve months. For the cohort with spells beginning after June 2002, the problem is the right-censoring that occurs in December 2003. For the earlier cohort with spells beginning in 2001, the convergence may be a result of income status changing over the course of the spell.

Figure 4 displays nonparametric hazard and survival estimates for FI spells from the administrative data. We are especially interested in differences in program behavior associated with the state's two-year time limit; so, we have disaggregated the spells by the amount of prior program participation. The top-left panel graphs the hazard function for families whose prior FI participation had been limited to less than a month and who would have begun their spells with nearly 24 full months of eligibility. The hazard function in this panel has a spike at twelve months, which is consistent with the large number of eligibility redeterminations that occur at this time point, and another large spike at 24 months, which is consistent with the time limit.

South Carolina grants exemptions to the two-year time limit under several circumstances, such as the primary caregiver being school-age, being disabled or making reasonable attempts at securing employment. As a result, we observe some spells terminating after the 24th month. As the survival estimates at the bottom of Figure 4 indicate, about ten percent of spells last beyond two years. The hazard estimates after two years are clearly lower than before; this may reflect the obstacles and disadvantages that the exempt group faces in achieving self-sufficiency.
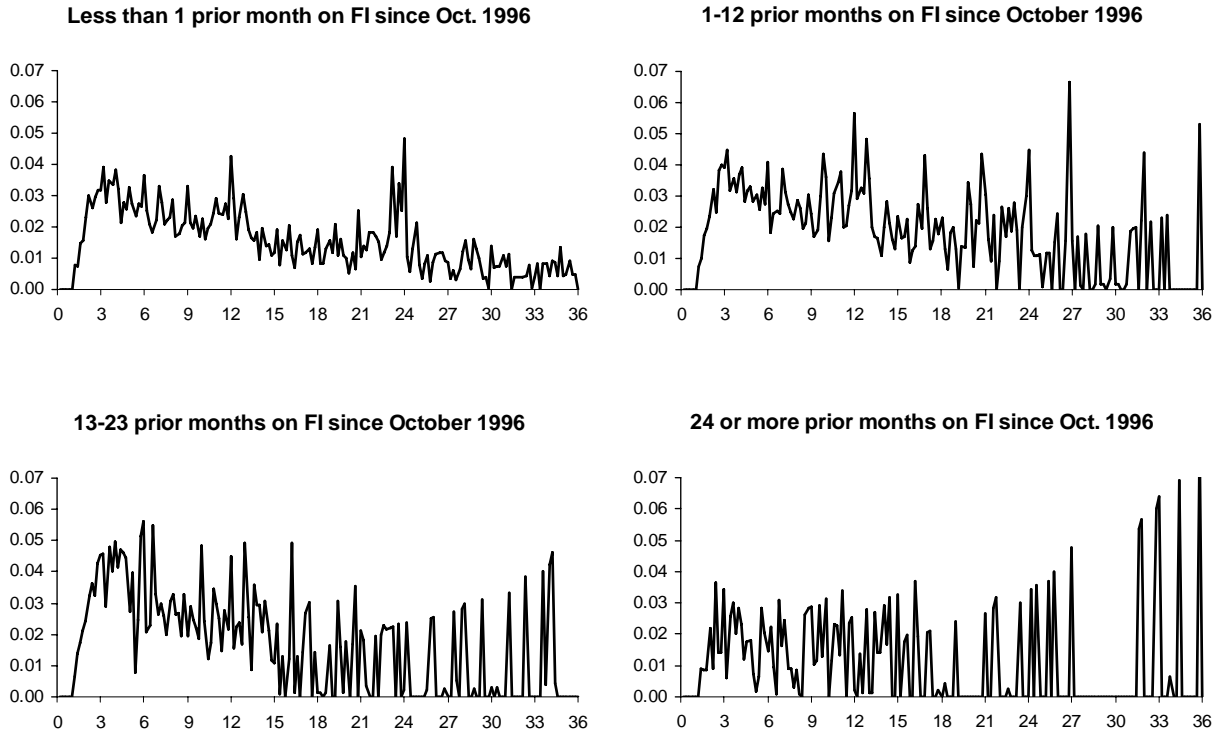
Figure 3: Nonparametric Hazards of Food Stamp Program Exits for Different Entry Cohorts of Families with Children Conditional on Initial Income Status
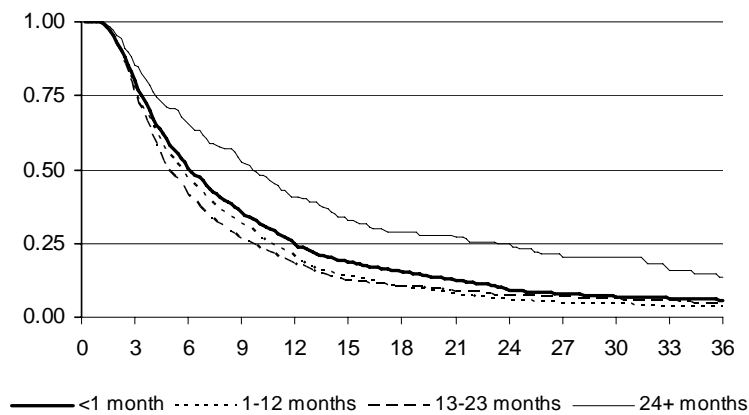

Spell began between July & December 2001 with a fluctuating income

Spell began between July & December 2001 with a fixed income

Spell began after June 2002 with a fluctuating income

Spell began after June 2002 with a fixed income
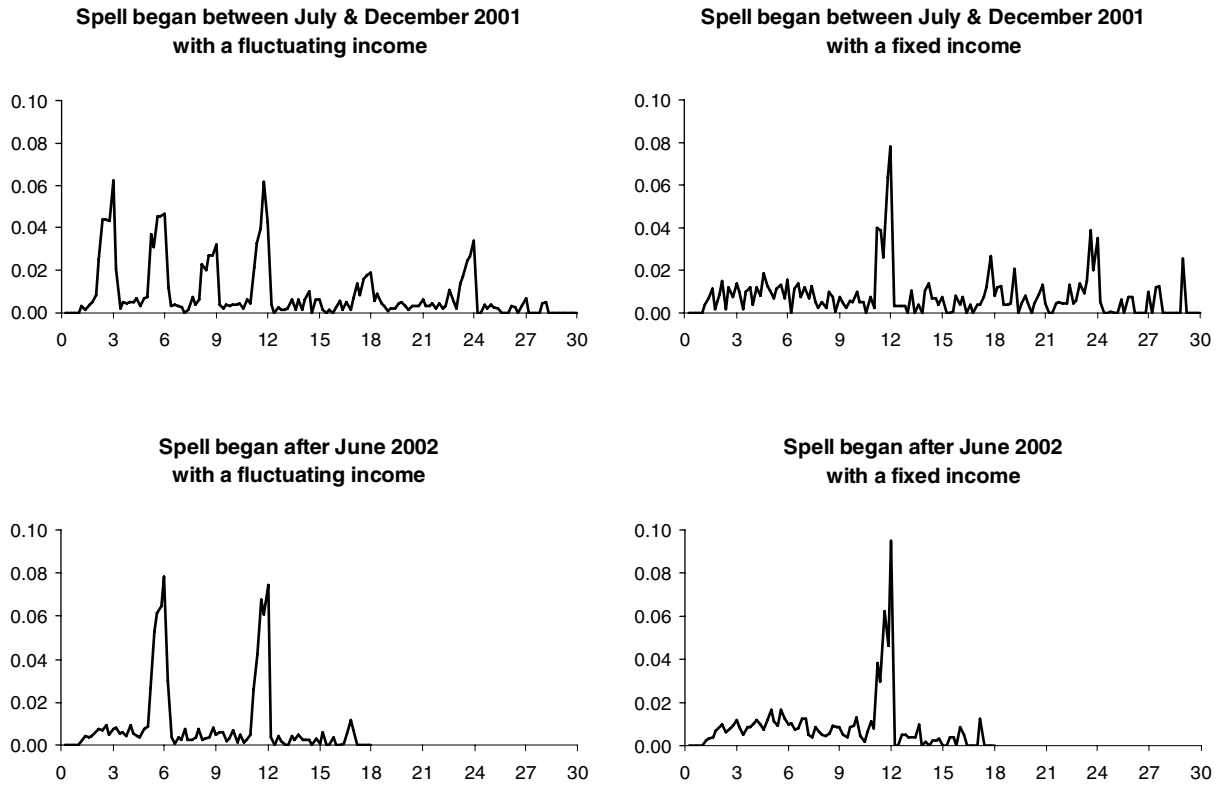
Note: Figures are Kaplan-Meier hazards, calculated using 6-day frequencies. The figures are computed using weighted administrative data from the South Carolina Department of Social Services. Units for the vertical axes are probabilities, while the units for the horizontal axes are months.
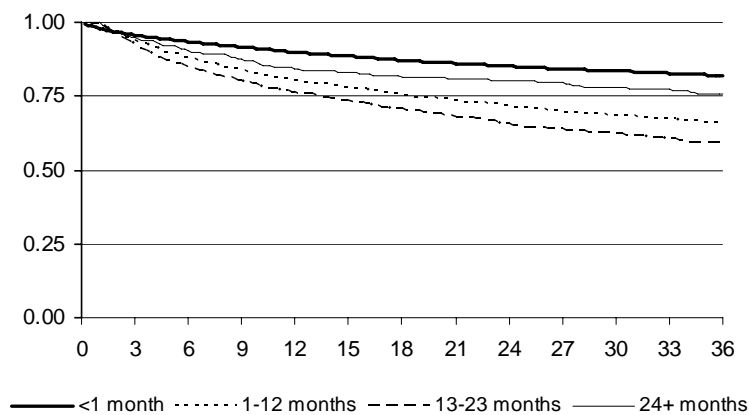
Figure 4. Nonparametric Event History Analysis of FI Program Exits for Families with Different Prior Program Histories

a. Hazard Functions

Less than 1 prior month on FI since Oct. 1996

1-12 prior months on FI since October 1996

13-23 prior months on FI since October 1996

24 or more prior months on FI since Oct. 1996

b. Survival Functions

Note: Figures are Kaplan-Meier hazard and survival functions, calculated using 6-day frequencies. The figures are computed using weighted administrative data from the South Carolina Department of Social Services. Units for the vertical axes are probabilities, while the units for the horizontal axes are months.

The upper-right panel in Figure 4 shows the hazard function for families who returned to FI and began a new spell with one to eleven months of prior FI participation. Most of these spells would have begun with 12-23 months of eligibility under the time limit. The hazard function for this group is higher over most of its initial range than the hazard function for the group with 24 months of eligibility. The graph becomes very jagged after the two-year point because of the small number of surviving cases. The lower-left panel graphs results for re-entrants with 13-23 months of prior FI experience and hence one to eleven months of eligibility. The hazard rates over the first twelve months for these spells are also noticeably higher than in the first graph. A jagged pattern with gaps in the hazard estimates appears after the 15th month again reflecting the small size of the risk set. The hazard estimates in the lower-right panel for the re-entrants with two years or more of prior FI experience are jagged across their entire range.

The survival estimates show that most FI spells were short. The median length for spells that began with a full 24 months of eligibility was roughly six months, while the median length for spells that began with 1-23 months of eligibility was slightly less. Even among the presumably exempt re-entrants with 24 or more months of prior program experience, the median spell length was between nine and ten months. Among the spells that began with a full clock, only one-quarter lasted beyond a year.

Figure 5 displays nonparametric hazard and survivor functions for spells of FI non-participation separately by prior FI experience. As with Figure 4, the intent behind disaggregating the results this way is to see the relationship between remaining eligibility under the time limit and program behavior. The graphs indicate that the probability of re-entering the FI program increases with prior experience and only begins to decrease when families have reached the two-year time limit. Some of this association may reflect higher participation among families with greater need—families with long FI participation histories may be especially disadvantaged and therefore prone to re-entering the program. However, the results also suggest that families may not be banking their eligibility, either because they behave myopically, do not understand the rules or lack opportunities for remaining off the FI program.

Figure 5. Nonparametric Event History Analysis of FI Program Entries and Re-entries for Families with Different Prior Program Histories
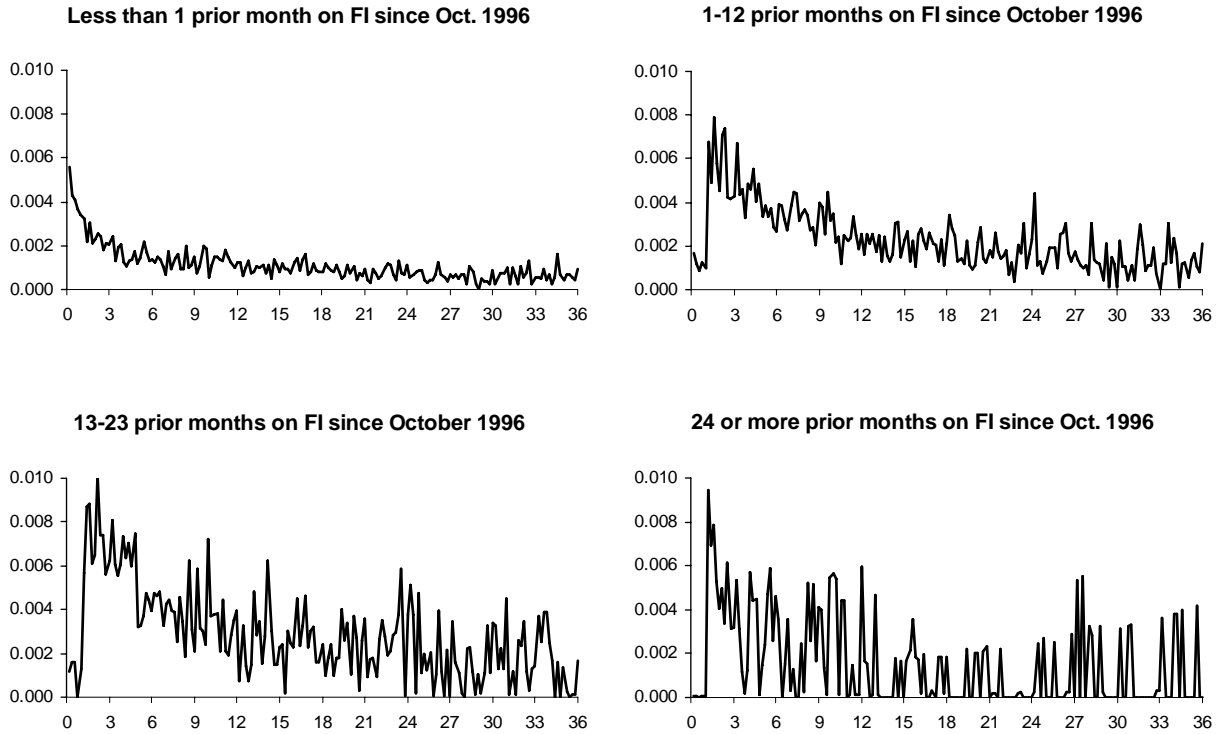
a. Hazard Functions

Less than 1 prior month on FI since Oct. 1996

1-12 prior months on FI since October 1996

13-23 prior months on FI since October 1996

24 or more prior months on FI since Oct. 1996

b. Survival Functions

<1 month ········ 1-12 months − − − − 13-23 months ———— 24+ months

Note: Figures are Kaplan-Meier hazard and survival functions, calculated using 6-day frequencies. The figures are computed using weighted administrative data from the South Carolina Department of Social Services. Units for the vertical axes are probabilities, while the units for the horizontal axes are months.

6. Econometric Specification

For our multivariate analyses, we estimate hazard models of exit from and entry into the Food Stamp Program, hazard models of exit from and entry into the FI program, and binary choice models of employment. The transitions into and from food stamps are specified to depend on FI participation and employment, while the transitions involving the FI program are specified to depend on employment. We apply Lillard's (1993) simultaneous hazards procedure to address problems of unobserved heterogeneity in all of the models and to account for the endogeneity of welfare participation and employment in the models in which they appear as explanatory variables. The econometric specification is discussed in more detail below.

To examine the determinants of the timing of exits from food stamps, we estimate a continuous-time log hazard model

Food stamp exit model: $\quad \ln h_{FS}(t) = A_{FS}'T_{FS}(t) + \gamma_{FS}P(t) + \delta_{FS}E(t) + B_{FS}'X_{FS}(t) + \eta.$ (1)

The hazard, $h_{FS}(t)$ is the probability of exiting the Food Stamp Program at time t conditional on having remained in the program until at least t. The hazard function is also a way of describing the length of a family's food stamp participation spell. In equation (1), $T_{FS}(t)$ represents a vector of duration variables; these are functions of the length of time that an ongoing participation spell has lasted and include controls for typical recertification deadlines. Among the other terms in equation (1), $P(t)$ is a time-varying indicator for FI participation; $E(t)$ is an indicator for employment; $X_{FS}(t)$ is a vector of other observed and possibly time-varying explanatory variables; η is an unobserved, time-invariant variable, and A_{FS}, γ_{FS}, δ_{FS} and B_{FS} are coefficients.

The presence of unobserved heterogeneity, or omitted variables, in the hazard function is a substantial complication. Unobserved heterogeneity arises because we are not able to measure all of the things that are relevant to families' food stamp participation decisions, such as their precise needs or attitudes regarding assistance. Failure to account for such heterogeneity can lead to biased estimates of the coefficients and especially to spurious indications of negative duration dependence. Following Lillard (1993), we assume that η is normally distributed with mean 0 and variance σ_η^2 and use a maximum likelihood procedure that accounts for the distribution of food stamp participation spell lengths under this assumption. The procedure is similar to the one developed by Butler and Moffitt (1982) for random-effect panel probit models in that it specifies the hazard function conditional on η and then integrates over the distribution and possible values of η.

A second complication is the endogeneity of FI participation and employment. This problem is addressed by estimating models of food stamp participation, FI participation and employment jointly and by allowing the unobserved determinants of these outcomes to be

correlated. The key assumption underlying this approach—that the source of bias is a time-invariant unobserved variable—is similar to that invoked when fixed effects or difference-in-difference estimators are used to address endogeneity. The correlated random effects approach is even more restrictive, however, because it requires the omitted variables to be conditionally independent of the observed variables in $X_{FS}(t)$.

Along with the model for exits from food stamps, we also estimate a model of the timing of entry or re-entry into food stamps (equivalently, exits from non-participation and spells of non-participation). The log hazard for this outcome is specified as

Food stamp entry/re-entry model: $\ln h_{NF}(t) = A_{NF}'T_{NF}(t) + \gamma_{NF}P(t) + \delta_{NF}E(t) + B_{NF}'X_{NF}(t) + \mu$ (2)

where $T_{NF}(t)$ is a vector of duration variables, $P(t)$ and $E(t)$ are defined as before, $X_{NF}(t)$ is a vector of other observed variables, μ is an unobserved, time-invariant variable, and A_{NF}, B_{NF}, γ_{NF} and δ_{NF} are coefficients. The unobserved variable μ is assumed to be normally distributed with mean 0 and variance σ_μ^2. The analysis allows for multiple, alternating spells of food stamp participation and non-participation.

The hazard functions for spells of FI participation and non-participation are specified as

FI exit model: $\ln h_{FI}(t) = A_{FI}'T_{FI}(t) + \delta_{FI}E(t) + B_{FI}'X_{FI}(t) + \lambda_{FI}\eta$ (3)

FI entry/re-entry model: $\ln h_{NA}(t) = A_{NA}'T_{NA}(t) + \delta_{NA}E(t) + B_{NA}'X_{NA}(t) + \lambda_{NA}\mu,$ (4)

respectively, where $T_{FI}(t)$ and $T_{NA}(t)$ are vectors of duration variables, $X_{FI}(t)$ and $X_{NA}(t)$ are vectors of observed explanatory variables, $E(t)$, η and μ are defined as before, and A_{FI}, A_{NA}, B_{FI}, B_{NA}, δ_{FI}, δ_{NA}, λ_{FI} and λ_{NA} are coefficients.

As equations (1) and (3) indicate, a single unobserved factor, η, is the source of unobserved heterogeneity in the models for food stamp and FI exits. While this results in a restricted distribution, the coefficient λ_{FI} in equation (3) relaxes the restriction somewhat. Without the coefficient (i.e., with $\lambda_{FI} = 1$), the sources of unobserved heterogeneity in the two participation models would be restricted to have the same variances and be perfectly, positively correlated. With the coefficient, the sources of unobserved heterogeneity in the two models can have different variances and be either perfectly positively *or* perfectly negatively correlated.

Equations (2) and (4) are similarly specified to share a common unobserved factor. The restriction that the four equations depend on only two underlying unobserved factors is adopted for reasons of tractability. Each unobserved factor increases the estimation time for the models exponentially; so, some limitations are necessary. As it turns out, the estimated values for λ_{FI} and λ_{NA} in the models that follow are all positive and generally close to one, with point estimates that range from 0.92 to 1.25.[9]

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[9] We experimented with alternative specifications in which one unobserved factor was associated with food stamp entries and exits while the other was associated with FI entries and exits. The alternative models produced lower likelihood values and less stable estimates of the factor loadings and correlation coefficients.

A discrete-time, binary-choice specification is used to model employment. In the model, the net benefits of employment for the primary informant of the family at time t are specified to be a linear function such that

Employment model: $$E^*(t) = B_E'X_E(t) + \nu + \varepsilon(t) \qquad (5)$$

where $X_E(t)$ is a vector of observed variables, ν is a normally distributed, time-invariant, unobserved variable with mean 0 and variance σ_ν^2, and $\varepsilon(t)$ is a normally distributed, transitory, unobserved variable with mean 0 and variance 1. The primary informant works to earn more than \$250 if the net benefits are positive ($E(t) = 1$ if $E^*(t) > 0$) and does not work otherwise ($E(t) = 0$ if $E^*(t) \leq 0$). The unobserved variable $\varepsilon(t)$ is assumed to be serially uncorrelated and independent of the other unobserved variable ν. With this assumption, employment is modeled as a random-effects probit.

The transitory error is also assumed to be independent of the other two time-invariant, unobserved variables, η and μ. However, η, μ, and ν are allowed to be freely correlated (the correlation coefficients are $\rho_{\eta\mu}$, $\rho_{\eta\nu}$, and $\rho_{\mu\nu}$). The four log hazard models and the random effects probit model are estimated jointly as a single system using the aML software package (Lillard and Panis 2003). The aML package employs Gaussian quadrature—a numerical approximation procedure—to evaluate the integrals over the three sources of time-invariant, unobserved heterogeneity in the likelihood functions. This study reports estimates from models that used ten quadrature points in each dimension, or 1,000 points total.[10]

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[10] For more information on the Gaussian quadrature technique, please see Butler and Moffitt (1982) and Lillard and Panis (2003).

7. Estimation Results

General specification issues

The food stamp and FI transition models are specified as proportional hazard models, which means that each model has a baseline duration dependence pattern, or baseline hazard, that is shifted up or down by the other observed and unobserved controls. An initial step in estimating the models is to specify the functional forms of the baseline hazards.

Two general sets of duration controls are used in all of the hazard models: piecewise-linear functions, or linear splines, for the durations of the spells and piecewise-linear functions for calendar time effects. The points where the segments of the spell duration splines connect differ across models. The duration splines in the food stamp exit models have 15 segments: twelve three-month segments covering the first three years of a participation spell, two six-month segments covering the fourth year of a spell and a final linear segment covering subsequent years.[11] The duration splines in the food stamp entry and re-entry models have eight segments that connect at months 2, 5, 9, 13, 18, 24 and 36. The duration splines in the FI exit models have twelve segments that join at months 3, 6, 9, 11, 12, 13, 18, 23, 24, 25 and 36, and the duration splines in the FI entry and re-entry models have eight segments that connect at months 3, 6, 9, 12, 18, 24 and 36. The number of segments and locations of the connecting points were selected after some initial experimentation and specification testing. For instance, the series of short, one-month segments at months 11-13 and 23-25 in the FI duration spline were introduced to capture effects associated with annual eligibility redetermination; specification tests confirmed that the slopes along these segments were different than the slopes along neighboring segments. The specifications of the linear splines for calendar time effects are common across the hazard models with initial nine-month segments that extend from October 1996 to June 1997 and a series of six-month segments thereafter. These were also selected after some testing.

In addition to the linear splines for duration dependence and calendar effects, the food stamp and FI exit models include other controls for program effects that evolve with the spell duration. In the food stamp exit models, there are four dummy-variable controls corresponding to potential recertification months—indicators for every third and twelfth month of a spell that occurs before October 2002 and indicators for every sixth and twelfth month of a spell that occurs after that.[12] Each indicator is set relative to the start date of a spell and covers a 31-day window that extends from 28 days before the potential recertification date to two days afterward.

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[11] The specific elements of the duration vectors in the food stamp exit models are $T_{0\text{-}3}(t) = \min(t, 3)$, $T_{4\text{-}6}(t) = \max[0, \min(t\text{-}3, 3)]$, $T_{7\text{-}9}(t) = \max[0, \min(t\text{-}6, 3)]$, … $T_{34\text{-}36}(t) = \max[0, \min(t\text{-}33, 3)]$, $T_{37\text{-}42}(t) = \max[0, \min(t\text{-}36, 6)]$, $T_{43\text{-}48}(t) = \max[0, \min(t\text{-}42, 6)]$, and $T_{49+}(t) = \max(0, t\text{-}48)$.

[12] We also estimated specifications of the food stamp exit model that included three-, six- and twelve-month dummy variables before and after October 2002. The coefficients on the six-month indicators before October 2002 and the three-month indicators afterward were insignificant and close to zero.

The dummy controls lead to discrete jumps in the hazard functions for food stamp exits at the beginning and end of potential recertification months. An examination of the nonparametric hazards and some preliminary testing guided the specification of these indicators.

The hazard models for FI exits include a third linear spline that evolves with the cumulative amount of time that a family received cash assistance after the FI program was implemented in October 1996. The spline has segments that connect at months 3, 9, 18, 23, 24, 25 and 36 and is used to examine effects associated with a family's progression toward the two-year time limit. Information associated with the spline is updated within FI spells and carried forward to subsequent spells. Thus, a family that is new to FI would start its participation spell with zero months in its spell-specific and cumulative participation clocks, and both clocks would then evolve over the course of the spell. If the family leaves FI and later returns to the program, its spell duration clock for the new spell would start over at zero months while its cumulative participation clock would pick up from the elapsed duration of the earlier spell. Because the spell duration and cumulative FI participation clocks evolve together, their separate effects are identified by returning families (we would never observe any differences in the two clocks if there was no re-entry or if we only considered initial participation spells).

Controls for the number of months of prior FI participation also appear in the FI entry/re-entry models. Because this experience variable remains constant over the course of a non-participation spell, it is only measured at the start of a spell and is not modeled as a duration variable. Thus, changes in the experience variable proportionally shift the duration pattern in the FI entry/re-entry hazard models up or down but do not otherwise alter the shape of the pattern.

It is important to remember that multiple clocks are running when we interpret the results from the multivariate models. For instance, the coefficients on the indicators for potential recertification months in the food stamp exit models represent the incremental effects of these variables conditioning on the spell-specific duration effects, calendar effects, and other controls. Similarly, the coefficients on the cumulative participation spline in the FI models represent effects conditioned on spell tenure, calendar time and other variables.

A second general specification issue involves the inclusion and distribution of the unobserved heterogeneity terms, η, μ and ν. Initial specification tests confirmed that controls for unobserved heterogeneity were necessary and that the heterogeneity terms were correlated across equations. In the results that follow, the models all include complete sets of controls for unobserved heterogeneity and correlations among the heterogeneity terms.

Estimation results for single-parent families

Coefficient estimates from the five-equation system for families with continuously unmarried primary informants are reported in Table 1. From left to right, the columns in Table 1 list results from the food stamp exit, food stamp entry/re-entry, FI exit, FI entry/re-entry, and employment models. The first 16 rows of the table list coefficients for measures of the household's and primary informant's observed characteristics. The next four rows list coefficients for the county-level variables. Coefficients for the recertification-month dummies

Table 1. Models of Food Stamp Transitions, Welfare Transitions and Employment: Unmarried with Dependents

	Food stamp exit	Food stamp entry	Welfare exit	Welfare entry	Employment
PI and HH characteristics					
Age spline through age 25	-0.0064	-0.0172 **	0.0362 ***	-0.0907 ***	0.0342 ***
	(0.0052)	(0.0067)	(0.0073)	(0.0085)	(0.0029)
Age spline ages 25-50	-0.0063 ***	-0.0242 ***	-0.0326 ***	-0.0307 ***	-0.0150 ***
	(0.0016)	(0.0021)	(0.0026)	(0.0034)	(0.0014)
Age spline after age 50	-0.0224 ***	-0.0081	-0.0280 ***	0.0007	-0.1409 ***
	(0.0049)	(0.0062)	(0.0074)	(0.0094)	(0.0054)
Female	-0.3148 ***	0.4949 ***	-0.2533 ***	0.4908 ***	0.4030 ***
	(0.0403)	(0.0585)	(0.0748)	(0.1028)	(0.0633)
African American	-0.4504 ***	0.4392 ***	-0.2721 ***	0.3686 ***	0.6692 ***
	(0.0198)	(0.0259)	(0.0308)	(0.0373)	(0.0282)
Completed high school	0.1149 ***	-0.2528 ***	0.1177 ***	-0.2043 ***	0.3519 ***
	(0.0184)	(0.0237)	(0.0279)	(0.0332)	(0.0152)
Completed some college	0.2856 ***	-0.4512 ***	0.2112 ***	-0.2934 ***	0.3436 ***
	(0.0278)	(0.0362)	(0.0441)	(0.0547)	(0.0224)
Formerly married	0.1228 ***	-0.1240 ***	0.0177	-0.0130	-0.0361 **
	(0.0208)	(0.0269)	(0.0338)	(0.0408)	(0.0171)
Children aged 0-2	-0.1284 ***	-0.0333 *	0.0005	-0.1128 ***	0.1172 ***
	(0.0149)	(0.0191)	(0.0225)	(0.0270)	(0.0060)
Children aged 3-5	-0.1839 ***	0.0173	-0.0511 **	-0.1337 ***	0.0432 ***
	(0.0150)	(0.0192)	(0.0234)	(0.0277)	(0.0064)
Children aged 6-11	-0.1271 ***	0.0044	-0.0290	-0.0802 ***	0.0223 ***
	(0.0111)	(0.0142)	(0.0182)	(0.0211)	(0.0054)
Children aged 12-14	-0.0944 ***	-0.0075	-0.0024	-0.0860 **	0.0322 ***
	(0.0171)	(0.0223)	(0.0290)	(0.0378)	(0.0071)
Children aged 15-17	0.0162	-0.0535 **	0.1384 ***	-0.3190 ***	0.0798 ***
	(0.0196)	(0.0263)	(0.0349)	(0.0435)	(0.0082)
Welfare participation	-0.2281 ***	-0.1209 ***			
	(0.0245)	(0.0417)			
Earnings/employment	0.4237 ***	-0.0409 **	0.6460 ***	-0.5682 ***	
	(0.0161)	(0.0191)	(0.0247)	(0.0286)	
County characteristics					
Unemployment rate	-0.0144 ***	0.0122 ***	-0.0131 **	0.0156 **	-0.0203 ***
	(0.0036)	(0.0043)	(0.0059)	(0.0062)	(0.0016)

Population density	-0.0171	-0.0257	-0.0745	0.1493	0.0047
	(0.0754)	(0.0965)	(0.1238)	(0.1390)	(0.0551)
Border county	0.0917 ***	0.0210	0.1527 ***	0.0041	-0.1414 ***
	(0.0171)	(0.0222)	(0.0271)	(0.0313)	(0.0178)
Exempt from ABAWD restr.	-0.0746 ***	-0.0268	-0.0325	0.0860 **	-0.0509 ***
	(0.0201)	(0.0247)	(0.0325)	(0.0362)	(0.0087)
Spell period dummies					
End of quarter (< 10/02)	1.3957 ***				
	(0.0176)				
End of year (< 10/02)	0.3260 ***				
	(0.0436)				
End of 6-months (≥ 10/02)	1.2304 ***				
	(0.0409)				
End of year (≥ 10/02)	0.4685 ***				
	(0.0590)				
Cumulative FI exper. spline					
0-3 months			0.0145	0.1360 ***	
			(0.0590)	(0.0163)	
4-9 months			0.0337 ***	0.0307 ***	
			(0.0091)	(0.0115)	
10-18 months			-0.0061	0.0106	
			(0.0067)	(0.0092)	
19-23 months			0.1507 ***	-0.1745 ***	
			(0.0167)	(0.0271)	
23-24 months			0.2867 **	-0.3362	
			(0.1320)	(0.2310)	
24-25 months			-0.4266 ***	-0.0563	
			(0.1338)	(0.2232)	
26-36 months			-0.0603 ***		
			(0.0123)	0.0318 ***	
37+ months			0.0064	(0.0075)	
			(0.0079)		
Calendar time spline					
Time trend 10/96-6/97	0.0041	-0.0427	0.0751 **	-0.0117	0.0180 ***
	(0.0168)	(0.0380)	(0.0324)	(0.0299)	(0.0019)

Time trend 7/97-12/97	-0.0393 ***	-0.0265	-0.0899 ***	-0.0088	
	(0.0110)	(0.0211)	(0.0198)	(0.0252)	
Time trend 1/98-6/98	-0.0014	0.0225	0.1020 ***	-0.0392 *	0.0183 ***
	(0.0095)	(0.0161)	(0.0158)	(0.0211)	(0.0013)
Time trend 7/98-12/98	0.0239 ***	-0.0345 **	-0.0244 *	-0.0300	
	(0.0088)	(0.0140)	(0.0147)	(0.0210)	
Time trend 1/99-6/99	-0.0024	0.0342 ***	0.0165	0.0364 *	0.0040 ***
	(0.0084)	(0.0121)	(0.0152)	(0.0192)	(0.0012)
Time trend 7/99-12/99	0.0084	-0.0591 ***	-0.0181	-0.0503 ***	
	(0.0082)	(0.0115)	(0.0155)	(0.0187)	
Time trend 1/00-6/00	-0.0067	0.0475 ***	0.0079	0.0635 ***	-0.0073 ***
	(0.0079)	(0.0109)	(0.0148)	(0.0177)	(0.0012)
Time trend 7/00-12/00	-0.0005	-0.0257 **	-0.0049	-0.0132	
	(0.0081)	(0.0103)	(0.0147)	(0.0165)	
Time trend 1/01-6/01	-0.0189 **	0.0638 ***	-0.0036	0.0363 **	-0.0150 ***
	(0.0081)	(0.0096)	(0.0142)	(0.0155)	(0.0017)
Time trend 7/01-12/01	-0.0427 ***	-0.0447 ***	-0.0528 ***	-0.0516 ***	
	(0.0080)	(0.0092)	(0.0137)	(0.0152)	
Time trend 1/02-6/02	-0.0164 **	0.0322 ***	0.0526 ***	0.0571 ***	0.0026
	(0.0081)	(0.0092)	(0.0130)	(0.0144)	(0.0025)
Time trend 7/02-12/02	0.0196 **	-0.0465 ***	-0.0323 **	-0.0851 ***	
	(0.0090)	(0.0099)	(0.0128)	(0.0151)	
Time trend 1/03-6/03	0.0359 ***	0.0649 ***	0.0464 ***	0.0706 ***	0.0048
	(0.0084)	(0.0099)	(0.0130)	(0.0150)	(0.0035)
Time trend 7/03-12/03	-0.0829 ***	-0.1547 ***	-0.0640 ***	-0.1612 ***	
	(0.0110)	(0.0148)	(0.0162)	(0.0229)	
Variance/Covariance Parms.					
σ_η^2, σ_μ^2, λ_{FI}, λ_{NA}, σ_ν^2	0.5809 ***	0.7450 ***	0.9415 ***	1.0995 ***	1.8336 ***
	(0.0172)	(0.0201)	(0.0588)	(0.0503)	(0.0150)
$\rho_{\eta\mu}$, $\rho_{\eta\nu}$, $\rho_{\mu\nu}$		-0.4968 ***	0.1463 ***	0.2452 ***	
		(0.0200)	(0.0107)	(0.0106)	
Log likelihood			-519445.51		
Cases			19305		
Spells/Outcomes	35110	26687	11613	25318	335508

* Significant at .10 level.   ** Significant at .05 level.   *** Significant at .01 level.

for the food stamp exit model appear in the next four rows followed by the coefficients for the cumulative FI experience variables. Coefficients for the splines for general calendar effects are listed in the next 14 rows. Estimates of the variance, factor loading and correlation parameters for the heterogeneity terms appear at the bottom of the table. To conserve space, intercepts and estimated parameters for the piecewise-linear duration functions in the hazard models are not reported (complete results are available upon request from the authors).

The estimates from Table 1 indicate that the food stamp and FI program clock variables are statistically and substantively important, even after other characteristics are controlled for. Families with unmarried informants were much more likely to leave the Food Stamp Program in recertification months—at quarterly and annual intervals prior to October 2002 and at half-yearly and annual intervals subsequently—than in other months. The estimated hazards are higher at annual intervals than other intervals, which is consistent with yearly recertifications being required of all families and more frequent recertifications being required of a subset of families.

The coefficient estimates for the cumulative program experience variables in the FI exit model indicate that more than three months of such experience is associated with a higher probability of exit. Specifically, there is an increment in the hazard that grows with the 4th through 9th months of experience, remains stable in the 10th through 18th months, grows again sharply in the 19th through 23rd months, and then spikes in the 24th month. The steep spike is consistent with a mechanical effect of families being forced off the FI program when they exhaust the time limit. As with the descriptive results from Figure 5, the model coefficients indicate that re-entry into the FI program initially increases with prior program experience. However, after 1½ years of experience, the probability of returning to FI falls. The coefficient estimates for the 24th month of program experience are even more strongly negative, but imprecisely estimated. All in all, the results from the FI exit and entry/re-entry models strongly indicate that the two-year time limit has reduced program participation.

The estimates from Table 1 indicate that employment is associated with faster exits from food stamps and FI and slower returns to the two programs for families with unmarried informants. Most of these associations are substantively large—earning $250 or more in a quarter increases the food stamp exit hazard by 53 percent (= exp(.4347)) and the FI exit hazard by 91 percent (= exp(.6460)). The results further indicate that FI participation is associated with slower exits from the Food Stamp Program, which we would expect. However, FI participation is also estimated to be associated with a decreased entry rate into food stamps, which seems counter-intuitive. One explanation for this result is that families who receive FI benefits but not food stamps are a small and selective group. The estimated association may reflect the receipt of cash assistance by child-only cases.

The number of young children, especially preschool-age children, is associated with longer stays on the Food Stamp and FI programs for families with unmarried informants. The number of young children is not significantly associated with entry and re-entry into the Food Stamp Program but is negatively associated with entry and re-entry into the FI program. The number of teenage children 15-17 years old is negatively related to entry and re-entry into both food stamps and FI. Interestingly, having more children of any age is associated with a higher

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probability of employment. The employment results suggest that children create more financial needs than they do job obstacles for unmarried parents.

Increased schooling is associated with faster exits from food stamps and FI and slower returns. Families with unmarried female and black informants experience longer spells of food stamp and FI participation and shorter spells of non-participation than similar families with male or non-black informants; however, female and black informants are more likely to work. Families with divorced and widowed informants are less likely to participate in food stamps and less likely to work than families with never-married informants. The informant's marital history is not significantly associated with FI receipt. Older informants work less and make fewer transitions onto and off of programs than do younger informants.

Living in a county with a high unemployment rate reduces the probability that an unmarried informant works, reduces exits from food and cash assistance, and increases entry and re-entry into assistance. The associations between the unemployment rate and program behavior come on top of the associations with the informant's own work activity. The associations may arise because the administrative employment variable is missing in some types of work; they may also be capturing employment opportunities for other people in the assistance unit. Living in a border county is also associated with faster exits from food stamps and FI and a lower probability of having covered earnings. These results likely reflect the failure of the UI earnings records to capture out-of-state employment. Families living in counties with ABAWD exemptions work less often, receive food stamps longer and return to FI sooner than those living in other counties. The strong results for the exemption variable may reflect the fact that some of the people in this sample fall into the ABAWD category for a portion of the time that they are observed. However, the results might also just be a manifestation of the extremely poor economic conditions in the exempt counties.

The controls for calendar time effects are jointly significant in the program and earnings/employment models. The coefficients in the employment model are consistent with the observed trends: employment increased through 1999, decreased in 2000 and 2001, and stagnated in 2002 and 2003. There is evidence of seasonal effects in the food stamp and FI entry/re-entry equations with entry into the programs generally increasing during the first half of each year and decreasing over the second half of each year. Beyond this, it is difficult to discern an overarching time pattern in program transitions.

The unobserved characteristics of families that hasten exits from food stamps and FI (the characteristics represented by the factor η) are strongly negatively correlated with the unobserved characteristics that hasten returns to these programs (represented by μ) and positively correlated with the unobserved characteristics that lead to employment (represented by ν). The unobserved characteristics that are associated with quick returns to assistance programs are positively correlated with unobserved characteristics associated with employment.

Estimation results for ever-married families

Results from models estimated for the families with primary informants who were ever observed to be married are reported in Table 2. Many of the results are qualitatively similar to those for the families with unmarried informants. Among the similar findings, exits from the

Table 2. Models of Food Stamp Transitions, Welfare Transitions and Employment: Ever Married with Dependents

	Food stamp exit	Food stamp entry	Welfare exit	Welfare entry	Employment
PI and HH characteristics					
Age spline through age 25	-0.0298 ***	-0.0183	-0.0097	-0.0524 **	0.0443 ***
	(0.0115)	(0.0152)	(0.0253)	(0.0239)	(0.0065)
Age spline ages 25-50	-0.0102 ***	-0.0235 ***	-0.0400 ***	-0.0197 ***	-0.0300 ***
	(0.0026)	(0.0035)	(0.0053)	(0.0071)	(0.0027)
Age spline after age 50	-0.0190 **	-0.0437 ***	-0.0347 **	0.0049	-0.1957 ***
	(0.0088)	(0.0121)	(0.0136)	(0.0210)	(0.0104)
Female	-0.1499 ***	0.4301 ***	-0.0401	0.3058 **	-0.1346 **
	(0.0400)	(0.0601)	(0.0938)	(0.1301)	(0.0678)
African American	-0.2478 ***	0.2867 ***	-0.2512 ***	0.1967 **	0.8500 ***
	(0.0325)	(0.0422)	(0.0655)	(0.0792)	(0.0544)
Completed high school	0.0759 **	-0.2383 ***	0.2280 ***	-0.1023	0.2591 ***
	(0.0316)	(0.0411)	(0.0650)	(0.0791)	(0.0329)
Completed some college	0.1475 ***	-0.4031 ***	0.1737 *	-0.2235 *	0.1479 ***
	(0.0490)	(0.0685)	(0.0996)	(0.1288)	(0.0459)
Formerly married	-0.1759 **	-0.4036 ***	-0.0912	-0.3273 **	-0.0506 *
	(0.0719)	(0.0892)	(0.1525)	(0.1459)	(0.0260)
Currently married	-0.0162	-0.7769 ***	-0.1326	-0.4875 ***	-0.1161 ***
	(0.0606)	(0.0777)	(0.1396)	(0.1137)	(0.0226)
Children aged 0-2	-0.0760 ***	0.0191	-0.0583	-0.1119 *	0.0327 ***
	(0.0244)	(0.0321)	(0.0498)	(0.0582)	(0.0112)
Children aged 3-5	-0.1104 ***	0.0376	-0.0145	-0.0650	-0.0162
	(0.0229)	(0.0318)	(0.0467)	(0.0556)	(0.0114)
Children aged 6-11	-0.0686 ***	0.0580 ***	0.0122	-0.0662	0.0235 **
	(0.0160)	(0.0210)	(0.0335)	(0.0414)	(0.0092)
Children aged 12-14	-0.1165 ***	0.0493	0.0016	-0.1495 **	0.1366 ***
	(0.0259)	(0.0346)	(0.0532)	(0.0750)	(0.0125)
Children aged 15-17	-0.0168	-0.0255	0.1579 **	-0.3469 ***	0.0590 ***
	(0.0296)	(0.0390)	(0.0692)	(0.0892)	(0.0129)
Welfare participation	-0.3689 ***	-0.1547			
	(0.0514)	(0.0954)			
Earnings/employment	0.2885 ***	-0.0807 **	0.6150 ***	-0.3744 ***	
	(0.0273)	(0.0345)	(0.0576)	(0.0671)	

County characteristics					
Unemployment rate	-0.0173 ***	0.0166 **	0.0006	0.0239 *	-0.0171 ***
	(0.0062)	(0.0079)	(0.0125)	(0.0143)	(0.0030)
Population density	-0.2022	-0.2937 *	-0.1138	0.4710	-0.3452 ***
	(0.1389)	(0.1756)	(0.2852)	(0.3465)	(0.1016)
Border county	0.0447	0.0746 *	0.1914 ***	-0.0295	-0.0332
	(0.0297)	(0.0393)	(0.0618)	(0.0755)	(0.0324)
Exempt from ABAWD restr.	-0.0965 ***	-0.0177	-0.0318	0.1035	-0.0681 ***
	(0.0352)	(0.0447)	(0.0731)	(0.0853)	(0.0162)
Spell period dummies					
End of quarter (< 10/02)	1.4852 ***				
	(0.0307)				
End of year (< 10/02)	0.2213 ***				
	(0.0833)				
End of 6-months (≥ 10/02)	1.5752 ***				
	(0.0656)				
End of year (≥ 10/02)	0.2513 **				
	(0.1012)				
Cumulative FI exper. spline					
0-3 months			0.0973	0.2006 ***	
			(0.1357)	(0.0393)	
4-9 months			0.0045	-0.0275	
			(0.0236)	(0.0299)	
10-18 months			0.0109	0.0484 *	
			(0.0187)	(0.0278)	
19-23 months			0.0350	-0.0618	
			(0.0493)	(0.0878)	
23-24 months			-0.2311	-1.6118	
			(0.5478)	(1.1882)	
24-25 months			-0.0198	1.3832	
			(0.5516)	(1.0927)	
26-36 months			0.0205		
			(0.0348)	0.0179	
37+ months			-0.0050	(0.0144)	
			(0.0157)		

Calendar time spline					
Time trend 10/96-6/97	-0.0302	-0.0053	0.0338	0.0444	0.0340 ***
	(0.0247)	(0.0729)	(0.0631)	(0.0744)	(0.0036)
Time trend 7/97-12/97	-0.0032	0.0055	-0.0507	0.0046	
	(0.0171)	(0.0343)	(0.0402)	(0.0541)	
Time trend 1/98-6/98	-0.0027	-0.0301	0.0339	-0.0319	0.0142 ***
	(0.0149)	(0.0260)	(0.0346)	(0.0454)	(0.0025)
Time trend 7/98-12/98	-0.0040	0.0103	0.0245	-0.0431	
	(0.0149)	(0.0227)	(0.0323)	(0.0474)	
Time trend 1/99-6/99	0.0190	0.0004	0.0029	0.0548	0.0110 ***
	(0.0152)	(0.0220)	(0.0346)	(0.0435)	(0.0021)
Time trend 7/99-12/99	0.0022	-0.0200	-0.0523	-0.0616	
	(0.0152)	(0.0218)	(0.0352)	(0.0458)	
Time trend 1/00-6/00	-0.0021	0.0135	0.1015 ***	0.0052	-0.0034
	(0.0148)	(0.0201)	(0.0342)	(0.0455)	(0.0021)
Time trend 7/00-12/00	-0.0048	-0.0015	-0.0539	0.0455	
	(0.0147)	(0.0189)	(0.0339)	(0.0425)	
Time trend 1/01-6/01	-0.0233	0.0455 **	0.0087	0.0625 *	-0.0042
	(0.0151)	(0.0183)	(0.0345)	(0.0354)	(0.0032)
Time trend 7/01-12/01	-0.0100	-0.0150	-0.0456	-0.0310	
	(0.0147)	(0.0174)	(0.0318)	(0.0351)	
Time trend 1/02-6/02	-0.0302 **	0.0359 **	0.0590 **	-0.0007	0.0032
	(0.0137)	(0.0162)	(0.0294)	(0.0324)	(0.0048)
Time trend 7/02-12/02	0.0145	-0.0212	-0.0592 **	-0.1037 ***	
	(0.0151)	(0.0169)	(0.0294)	(0.0370)	
Time trend 1/03-6/03	0.0481 ***	0.0417 **	0.0731 **	0.0846 **	0.0064
	(0.0145)	(0.0169)	(0.0292)	(0.0389)	(0.0068)
Time trend 7/03-12/03	-0.0954 ***	-0.1612 ***	-0.0774 **	-0.2578 ***	
	(0.0193)	(0.0260)	(0.0386)	(0.0637)	
Variance/Covariance Parms.					
σ_η^2, σ_μ^2, λ_{FI}, λ_{NA}, σ_v^2	0.5223 ***	0.6799 ***	1.0120 ***	1.2401 ***	1.9887 ***
	(0.0314)	(0.0348)	(0.1380)	(0.1186)	(0.0312)
$\rho_{\eta\mu}$, $\rho_{\eta v}$, $\rho_{\mu v}$		-0.4300 ***	0.1517 ***	0.3175 ***	
		(0.0421)	(0.0179)	(0.0204)	
Log likelihood			-154150.97		
Cases			6002		
Spells/Outcomes	11419	9228	2482	7293	107457

Note: Estimates based on weighted administrative data from the South Carolina Department of Social Services. Models calculated using Guassian quadrature with 10 points in each dimension. Intercepts and coefficients for piecewise linear duration dependence patterns in hazard models are not reported. Asymptotic standard errors in parentheses.

* Significant at .10 level.   ** Significant at .05 level.   *** Significant at .01 level.

Food Stamp Program are concentrated in months when families must recertify their eligibility. Employment is positively associated with program exits and negatively associated with program returns. FI participation is once again negatively associated with transitions into and out of the Food Stamp Program, though the coefficient on transitions into the program falls short of statistical significance. Black families are more likely to rely on public assistance but also more likely to have covered earnings than other families. The informant's level of schooling is negatively associated with program participation and positively associated with work. Better local job opportunities are negatively associated with food stamp participation and positively associated with employment. The pattern of results for the unobserved heterogeneity controls is also similar across groups.

There are also some differences in the model estimates for the continuously unmarried and ever-married groups. An important difference is that there is less evidence of impacts from the two-year time limit for the families with ever-married informants. The coefficients on the segments of the linear spline for cumulative program experience in the FI exit model are all individually insignificant. The pattern of results for the program experience variables in the FI entry/re-entry model is similar to the pattern from Table 1, but the coefficients for higher levels of experience are imprecisely estimated. It is difficult to estimate the effects of FI program experience for the ever-married group because of the small number of families who participate and return to the program (recall that information on initial entrants and re-entrants is necessary to identify experience effects) and the high rates of attrition from the program.

Another difference between the unmarried and ever-married groups is in the effects of children. For both groups, higher numbers of young children are associated with longer stays on food stamps. However, among the families with ever-married informants, the number of children 6-11 years old is associated with a higher probability of returning to food stamps (the corresponding coefficient from Table 1 was small and insignificant) while the number of children 3-5 years old is associated with a lower probability of working (the corresponding coefficient from Table 1 was significantly positive).
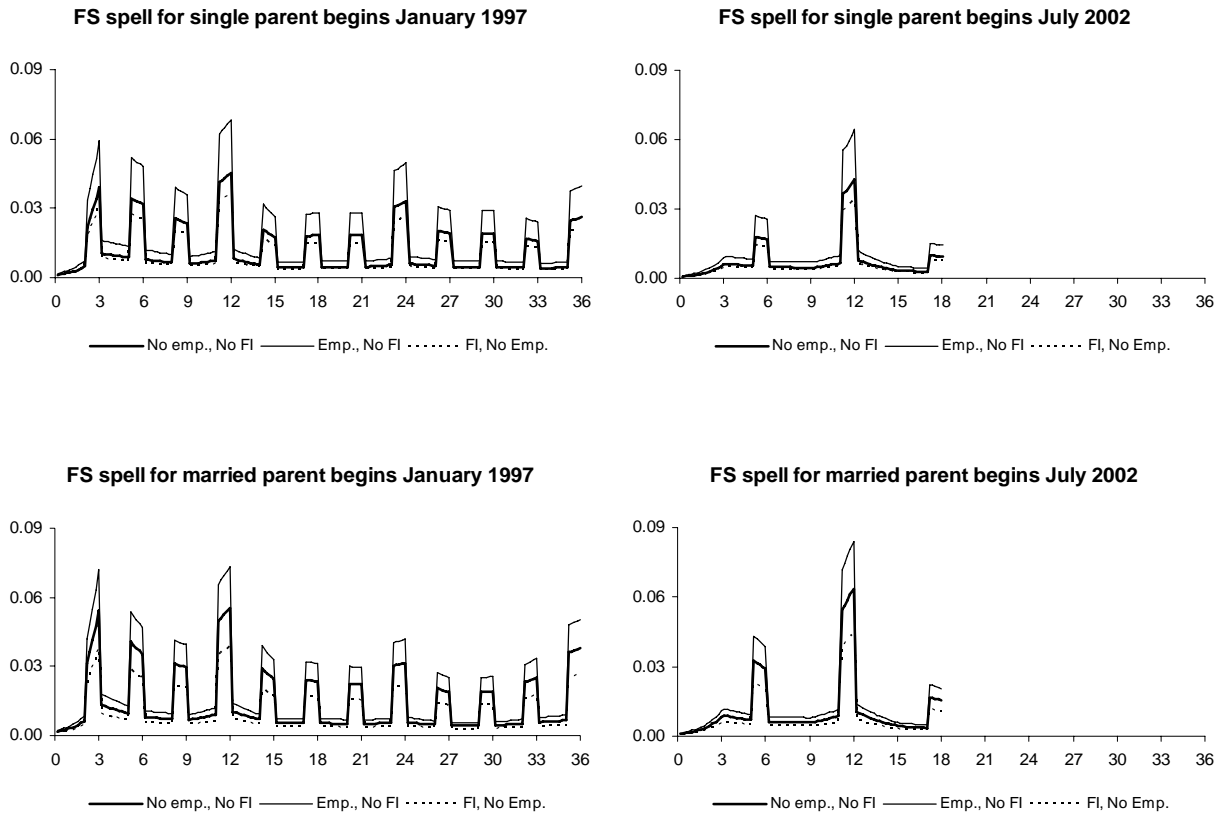
There are also differences in the estimated effects of population density. The coefficients for population density were insignificant in each of the program and employment models for families with continuously unmarried informants. For the ever-married group, however, population density is estimated to be significantly, negatively related with both employment and entry/re-entry into the Food Stamp Program.

Simulation results

There are numerous statistically significant coefficients in Tables 1 and 2. From these estimates, it is easy to determine the directions of relationships among the explanatory and outcome variables but very difficult to judge the magnitudes of these relationships. Interpretation of the results is complicated by our use of a nonlinear model and our use of overlapping duration variables. To show what the estimated hazard functions look like and illustrate how they differ with key variables, we use the coefficients from Tables 1 and 2 (including the suppressed baseline hazard coefficients) to calculate hazard functions for several hypothetical cases.

Figure 6 displays predicted hazards for leaving the Food Stamp Program for a hypothetical family headed by a non-black mother who is 35 years old at the start of her spell. In all of the predictions, we assume that the informant has one preschool-aged and one school-aged

Figure 6. Simulated Hazard Functions for Exiting Food Stamp Program

FS spell for single parent begins January 1997

No emp., No FI ——— Emp., No FI ······· FI, No Emp.

FS spell for single parent begins July 2002

No emp., No FI ——— Emp., No FI ······· FI, No Emp.

FS spell for married parent begins January 1997

No emp., No FI ——— Emp., No FI ······· FI, No Emp.

FS spell for married parent begins July 2002

No emp., No FI ——— Emp., No FI ······· FI, No Emp.

Note: Simulations are based on estimates from Tables 1 and 2 and use a 6-day resolution. Simulations assume that the primary informant was a white female, age 35, with a high school education, with one child aged 3-5 and one child 6-11, and living in a non-border county with 2,000 people per square mile, a 6 percent unemployment rate and no ABAWD exemption. Units for the vertical axes are probabilities, while the units for the horizontal axes are months.

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child, has a high school diploma, and lives in a non-border county with a population density of 2,000 people per square mile, a six percent unemployment rate and no ABAWD exemption. We alter other characteristics in the predictions. Specifically, we consider how spells from the short recertification regime compare with spells from the long recertification regime by simulating hazards with start dates of January 1, 1997 and July 1, 2002, respectively. We also consider how spells differ between families with continuously unmarried and married informants. For each combination of starting date and marital status, we further distinguish between families who were (a) neither working nor receiving FI, (b) working but not receiving FI, and (c) receiving FI but not working.

The simulated hazards clearly capture the recertification pattern that was uncovered in the descriptive analysis. The coefficients on the three- and twelve-month dummy variables before October 2002 and the six- and twelve-month dummy variables after October 2002 lead to noticeable spikes in the hazard functions. Some features of the spline for duration dependence are discernable, especially the rises and falls in the baseline hazard around the third and twelfth months. However, the impacts of the dummy variables for potential recertification months dominate this baseline hazard pattern. A noticeable difference from the descriptive results is that there is much less evidence of negative duration dependence in the hazards in Figure 6. The baseline hazards in the simulations are higher in the first year of a spell than later years, but the decreases are much smaller than in the descriptive graphs. The statistical controls for other observed and unobserved variables are primarily responsible for this.

The differences in the hazards for cases with primary informants who do and do not earn $250 per quarter are stark for each of the marital groups. In the simulations for unmarried informants, the hazard rates double for those earning more than $250 a quarter. For the spell that was simulated to begin in 1997, the median predicted spell length drops from 11.5 months to 7.6 months. In the simulations for married informants, the hazards increase by a third, and the median predicted spell length for the 1997 entrant drops from 8.9 to 6.1 months. The decreases in exit rates associated with FI participation are also dramatic: the hazards decrease by 20 percent for families with unmarried informants and 32 percent for families with married informants. For the 1997 unmarried and married entrants, the predicted median spell lengths increase to 12.7 and 11.9 months, respectively.

The differences in the shapes of the hazards from the short and long recertification regimes suggest one other interesting simulation. The estimation results and simulated hazards plainly indicate that the month-to-month exit behavior changed—e.g., families were much more likely to exit food stamps in the third or ninth month of a spell under the old policy than under the new policy. It is harder to determine, however, what impact this had on spell lengths. To examine this, we conducted additional simulations in which we took the baseline characteristics for 1997 spells for the hypothetical families in Figure 6 and changed the recertification indicator values and coefficients from their 1997 values to their October 2002 values. Thus, relative to the baseline 1997 simulations in Figure 6, the only thing that we altered was the recertification policy. When we did this, the median predicted spell lengths for families with unmarried and married informants each increased by nearly three months to 14.2 and 11.7 months, respectively. The simulation results indicate that South Carolina's adoption of longer recertification intervals has contributed substantially to the increase in its food stamp caseload.

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Figure 7 displays simulated hazards for exiting the FI cash assistance program. These use the model coefficients from the third columns of Tables 1 and 2 and the same assumptions regarding personal and family characteristics as Figure 6. For brevity, we only report simulations for hypothetical spells beginning in 1997. The thick lines in Figure 7 are from baseline simulations in which we assume that the primary informant does not work. For the hypothetical family with an unmarried informant, there are spikes in the hazard at the one- and two-year points in the hazard. The jump in the hazard at the end of two years is especially large. For the hypothetical family with a married informant, there is only a spike at the two-year point. Once again, the corrections for observed characteristics and unobserved heterogeneity attenuate the earlier patterns of negative duration dependence.

The thin lines in Figure 7 are from simulations in which we keep the family's cumulative FI experience fixed at zero. Thus, a comparison of the thick and thin lines shows the differences in exit behavior attributable to program experience. If we assume that the experience variable captures a family's time against the two-year limit, the comparison is effectively between having and not having a time limit. The results indicate that program experience, and presumably the two-year time limit, contributes to faster exits from the FI program. The differences are apparent relatively early in a spell. This buttresses the hypothesis advanced by Grogger (2002, 2003) and Grogger and Michalopoulos (2003) that there are anticipatory effects associated with time limits. The large spike at 24 months for unmarried families also suggests there is a sizeable mechanical effect for families who exhaust their eligibility. While there is a bigger difference in the hazard functions at 24 months than at other months, it is important to remember that the cumulative effects of the hazard functions mean that only a small percentage of families are still on the FI program this long. The anticipatory effects, which begin earlier in a spell (when more families are still on the FI program) and are also cumulative, lead to larger overall differences in participation rates.

Figure 7. Simulated Hazard Functions for Exiting FI Program

Unmarried Parent

Married Parent

Note: Simulations are based on estimates from Tables 1 and 2 and use a 6-day resolution. Simulations assume that the primary informant was a white female, age 35, with a high school education, with one child aged 3-5 and one child 6-11, living in a non-border county with 2,000 people per square mile, a 6 percent unemployment rate and no ABAWD exemption, and began her FI spell on January 1, 1997. Units for the vertical axes are probabilities, while the units for the horizontal axes are months.

8. Conclusion

This study has used family-level administrative data from the state of South Carolina, supplemented with county-level economic, demographic and policy data, to conduct descriptive analyses and estimate multivariate models of transitions onto and off of food stamps, transitions onto and off of FI, and employment over the period 1996-2003. The multivariate models for food stamp transitions include FI participation and employment as explanatory variables, while the models of FI participation include employment status as an explanatory variable. The transition models include controls for program clocks—FI time limits and food stamp recertifications. The models also include controls for time-invariant unobserved heterogeneity, which address problems with spurious negative duration dependence and endogenous explanatory variables in the transition models.

There is strong evidence from both the descriptive analyses and multivariate models that food stamp recertification and TANF time limit policies affect participation, the timing of exits and the length of assistance spells in the relevant programs. Non-parametric estimates of the timing of food stamp exits show that exits were much more likely to occur during months when families in South Carolina were required to recertify their eligibility than in other months. South Carolina changed its recertification policy in October 2002 and also set different recertification intervals for families with fixed and fluctuating incomes. The patterns in the exit data correspond with these variations in policy. The study's multivariate models of food stamp exits provide similar results. The estimated sizes of the effects are very large. Median spell lengths for food stamp participation increased by nearly three months after the state began requiring families with fluctuating incomes to recertify semi-annually instead of quarterly. The change in policy appears to have contributed to the record growth rates and levels of food stamp participation that South Carolina has experienced in the last few years.

Analyses of FI participation spells indicate that there is a marked increase in the hazard of leaving the program at the second anniversary, which is consistent with families exhausting their time limits. There is also an elevated chance of leaving at the one-year mark, which corresponds with the time when many families have their eligibility redetermined. We estimated multivariate models that included measures of a family's cumulative participation on FI, and hence its cumulative time toward the two-year limit, as explanatory variables. The models revealed that a family's probability of leaving the FI program increased with its accumulated experience and spiked when its experience reached two years. The results buttress earlier findings by Grogger and Michalopoulos of anticipatory, or banking, effects of time limit policies and provide new evidence of mechanical, or eligibility-exhaustion, effects. The state's stringent time-limit policy appears to be one reason why its number of FI cases grew so modestly during the recent recession. One caveat to our findings is that there was no significant change in South Carolina's time limit policy over the course of our study. Our conclusions are drawn entirely from the timing pattern of FI exits and the probabilities of re-entry. Nevertheless, the patterns are striking and make a compelling case that time limits are responsible.

In our multivariate models, we also find that employment is associated with faster exits from the Food Stamp and FI programs and slower returns to these programs. The point estimates imply that the probabilities of leaving food assistance for cases with employed heads are 30 to 50 percent higher than the probabilities for cases with non-working heads. Estimates of the corresponding differentials from the cash assistance exit models are even larger. The very low income threshold for benefits in South Carolina makes it difficult for families in the state to combine public assistance with employment. The results of this study are consistent with other studies that have found that changes in economic opportunities have played a large role in caseload dynamics.

The study also finds that families who participate in South Carolina's FI cash assistance program are less likely to leave food stamps than families who do not participate in FI. Point estimates imply that the food stamp exit hazard rates for FI participants are 20 to 30 percent lower than those for non-participants. This strong association is expected, as most FI participants are categorically eligible for food stamps. The results may also reflect greater need among FI recipients. Even though our models account for many time-varying observable characteristics and for permanent unobserved characteristics among families, there may still be some unmeasured, time-varying characteristics related to needs that account for the association between FI and food stamp participation.

As food stamp caseloads continue to swell and as more families exhaust their eligibility for TANF, the Food Stamp Program is becoming a more important part of the safety net. Issues associated with the administration of food stamps are also becoming more prominent. We have shown that redetermination is a significant "bump in the road" for food stamp recipients. Because we have only examined participation and not eligibility, we cannot say whether recertification is a useful bump that removes ineligible families from the program, an obstacle that keeps some eligible families from renewing their participation, or some combination of the two. We hope to examine these questions in subsequent research. South Carolina has clearly followed a dual-track approach of increasing the bumps for welfare recipients through its adoption of a short time limit and other reforms and smoothing the bumps for food stamp recipients through its outreach efforts and longer recertification intervals. These policy changes have profoundly altered the distribution of the assistance in the state away from cash benefits and toward food stamps.

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Appendix A. Means of Analysis Variables

	Continuously unmarried	Ever married
Primary informant and household characteristics		
Female	0.95	0.82
African American	0.65	0.36
Age	31.82	34.41
Completed high school	0.53	0.51
Completed some college	0.12	0.11
Currently married		0.85
Formerly married	0.40	0.11
Number of children aged 0-2	0.41	0.41
Number of children aged 3-5	0.33	0.37
Number of children aged 6-11	0.59	0.75
Number of children aged 12-14	0.23	0.30
Number of children aged 15-17	0.18	0.23
Months observed on food stamps	22.93	19.34
Months observed off food stamps	24.59	29.97
Months observed on FI	4.58	3.49
Months observed off FI	42.94	45.81
Quarters with earnings above $250	7.97	6.57
Quarters with earnings below $250	8.32	10.32
County characteristics		
Unemployment rate	6.06	6.06
Population per square mile (000s)	0.20	0.19
Border county	0.42	0.45
Exempt from ABAWD restrictions	0.60	0.58

Note: Estimates computed using weighted administrative data from the South Carolina Department of Social Services. Means for gender, program participation and employment variables calculated from case-level observations. Means for other variables calculated from quarterly earnings observations.