The Effects of Government Transfers on Monthly Cycles in Drug Abuse, Crime and Mortality

Carlos Dobkin[*] and Steven L. Puller[**]

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Abstract

This paper analyzes the monthly patterns of adverse outcomes due to the consumption of illegal drugs by recipients of government transfer payments. We find evidence that certain subpopulations on government cash aid significantly increase their consumption of drugs when their checks arrive at the beginning of the month, and as a result, experience adverse events including arrest, hospitalization, and death. Using data from California, we find that the overall rate of drug related hospital admissions increases abruptly at the beginning of the month, with admissions increasing 25% during the first five days of the month. We find that this cycle is driven largely by recipients of Supplemental Security Income (SSI). SSI recipients also experience an abrupt 22% increase in within hospital mortality after receiving their checks on the first of the month. We also document pronounced monthly cycles in drug related crimes. On the first of the month, arrests for drug possession and sale increase by 20% and prostitution arrests decline by 16%. These findings suggest that "full wallets" adversely affect some aid recipients and that policymakers should explore alternate disbursement regimes such as a staggered disbursement schedule or in-kind support that have the potential to reduce the rate of adverse events.

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[*] Department of Economics, University of California Santa Cruz. Email: cdobkin@ucsc.edu

[**] Department of Economics, Texas A&M University. Email: puller@econmail.tamu.edu We acknowledge financial support from the Robert Wood Johnson Foundation's Substance Abuse Policy Research Program. Ken Chay, Jun Ishii, Ted Joyce, Lori Kletzer, Steve Wiggins and Donald Wittman provided very helpful comments. We thank seminar participants at Texas A&M and the 2005 SOLE meetings for valuable feedback and Paige Skiba for allowing us to use results from her paper .

I. Introduction

Government transfer payments such as welfare (TANF), disability insurance (DI), and Supplemental Security Income for the Disabled (SSI) checks are typically disbursed to recipients at the beginning of each month. There is anecdotal evidence that these payments create "full wallets" that increase the consumption of illicit drugs among recipients with substance abuse problems. In addition, the public health literature has documented that drug related hospital admissions and deaths are higher at the beginning of the month (for example, see Phillips et al., 1999 and Halpern and Mechem 2001). However the papers in this literature are unable to determine if government transfer programs cause the adverse events because their datasets lack information on program coverage. In this paper, we use a variety of data sources to measure the effect of monthly cash transfer payments on the monthly patterns of drug related hospitalizations, crime and mortality. We determine which government transfer programs lead to monthly cycles in drug-related adverse events and estimate the size of the cycles.

An extensive literature has investigated whether consumption follows a smooth pattern despite income being received at discrete points in time. A variety of micro-level studies find that consumers do not always smooth consumption, and that the receipt of disposable income can lead to immediate increases in consumption, even when the income is anticipated.[1] In particular, some studies analyze recipients of government transfers and find that their consumption is higher in the period of the month immediately following receipt of the transfer payment. Stephens (2003) finds that people whose primary income is from Social Security exhibit roughly a 16% increase in "instantaneous consumption" items, such as dining out, in the week following the receipt of their checks; Shapiro (2005) finds that Food Stamp recipients' caloric intake decreases 10-15% over the course of the month. Most authors study these cycles in consumption in the context of testing the life-cycle/permanent income hypothesis, with the implication being that

[1] For example, the existing literature includes analyses of the immediate consumption response to semi-annual bonuses (Browning and Collado, 2001), paycheck receipt (Stephens, 2006), income tax refunds (Souleles, 1999), Social Security taxes (Parker, 1999), annual payments to Alaskans from the Alaska Permanent Fund (Hsieh, 2003), tax rebates (Johnson, Parker and Souleles, 2004), the final payment of a car loan (Stephens, 2005) and anticipated and unanticipated household energy costs (Cullen, Friedberg and Wolfram, 2004). The results regarding excess sensitivity are somewhat mixed. For an older survey, see Browning and Lusardi (1996).

violation of consumption smoothing leads to utility losses. However, even studies that find violations of consumption smoothing often find utility losses to be small in practice. In the case we examine, the utility loss is likely quite large, though we do not examine it directly. Because we do not directly observe drug consumption we focus on the, arguably more interesting, adverse effects of drug consumption: hospitalization, mortality, and crime. The increase in hospitalizations and crime that occurs at the beginning of the month puts considerable stress on health providers and police because they are constrained by fixed resources. So unlike some of the cycles in consumption documented in the economics literature, the cycles we examine impose a considerable cost on both individuals and society.

In this paper we make five contributions. First, we document the existence and magnitude of the monthly cycle in drug related hospital admissions in California and determine how the cycle varies by drug. Second, we show that SSI and DI recipients drive the cycle in drug related hospitalizations. Also, contrary to what some analysts have suggested, welfare contributes very little to the cycle. Third, we show that Phillips' estimate of the mortality increase at the beginning of the month understates the true amplitude of the cycle in mortality caused by government transfers; the Phillips' estimate combines a large population with no cycle in mortality with a much smaller population with a very pronounced cycle in mortality. We find that SSI recipients experience a 22% increase in mortality after receiving their checks. Fourth, we document that after checks arrive at the beginning of the month, there is an increase in arrests for drug possession and a decrease in arrests for some revenue generating crimes. To our knowledge, this is the first paper to document the existence of a cycle in arrests. Finally, we provide evidence that smoothing the disbursement of cash aid can reduce the monthly cycle in hospitalizations due to substance abuse. These findings suggest that there are particular subpopulations that might benefit significantly from alternate aid disbursement regimes.

This paper uses patient-level data on admissions to California hospitals that occurred between 1994 and 2000. To identify recipients of welfare and Supplemental Security Income for the Disabled (SSI), each patient's hospital record is linked to their Medi-Cal eligibility history. We also use a census of deaths in California (1994-2000) to examine deaths that occur outside the hospital. Finally we use a census of arrests in

California (1993-1999) to determine how arrest patterns change at the beginning of the month. The mortality records and the arrest records have the limitation that the program participation of individuals is unknown.

As shown in Figure 1, the number of drug related hospital admissions begins to rise at the beginning of the month and peaks on the sixth day of the month. The cycles for cocaine and amphetamine peak a couple of days earlier and are considerably more pronounced than the cycles for heroin and alcohol. The cycle for cocaine is particularly striking, with 37% more admissions occurring on the sixth of the month than on the first.

Next we determine how much of this cycle in drug related admissions is caused by recipients of government cash aid. We are able to directly identify welfare and SSI recipients and indirectly identify Social Security Disability Income (DI) recipients. We find that the cycle in admissions is driven primarily by SSI and DI recipients. For both types of recipients, a surge in hospital admissions begins the day after the arrival of aid checks and peaks several days later. SSI aid arrives on the first of the month and hospital admissions begin rising on the second; DI aid arrives on the third of the month and the admissions surge begins on the fourth. We find that welfare recipients have low levels of drug related admissions and only a weak monthly cycle in admissions. In addition, we find that the rate at which welfare and SSI recipients exit the hospital, particularly against medical advice, is distinctly higher on the days that the checks arrive. It is also worth noting that only a very small proportion of the people enrolled in either welfare or SSI are experiencing drug related hospitalizations. There is less than one cocaine-related hospitalization per month for every 10,000 welfare enrollees and 7.4 hospitalizations per month for every 10,000 SSI recipients.

This evidence strongly suggests a causal relationship between cash aid and the cycle in drug related hospitalizations -- admissions start rising shortly after the checks arrive and the populations that we examine receive the vast majority of their income from government transfers. However, one might be concerned that the cycle in drug related hospitalizations could reflect other factors such as the timing of drug distribution, monthly cycles in stress, or cycles in other income (though we do not find cycles in drug related admissions among people not covered by these programs). To deal with these concerns, we implement a more direct test of the hypothesis that there is a causal

relationship between check arrival and the increase in drug hospitalizations. We exploit a change in the timing of welfare check disbursement in Los Angeles County. In 1997, Los Angeles County switched the timing of welfare distribution from the first of the month to a staggered schedule over the first 10 days of the month. We find that this change shifted the peak in hospital admissions in Los Angeles to later in the month and flattened the cycle. Over the same period, we do not observe a change in the cycle among either welfare recipients in other large counties or among non-welfare aid recipients in Los Angeles, suggesting that the changes we observe in Los Angeles were due to the change in disbursement rather than due to other factors.

Next we investigate the monthly cycle in mortality. We use the hospital admission data and a census of mortality records to determine if the arrival of government transfer checks causes an increase in mortality. We find that at the beginning of the month, there is an immediate 22% increase in the within hospital mortality rate of SSI recipients. This increase occurs on the first of the month immediately after the receipt of the checks. We do not find corresponding large increases in mortality for other subpopulations. Also, statewide mortality data reveal that the increase in deaths is occurring both inside and outside the hospital. The increase in deaths is due primarily to motor vehicle accidents, drug overdoses and alcohol overdoses.

Finally, we study the monthly cycle in crime. Though our data do not allow us to observe if particular arrestees are covered by government transfer programs, we find that arrest patterns change in a manner consistent with our other findings. Consistent with the large increase in drug related hospitalizations described above, we find a 20-25% increase in arrests for drug possession and sale at the beginning of the month. Surprisingly, we also find evidence of modest reductions in revenue generating crime and a striking 16% reduction in prostitution arrests. The increase in drug arrests is consistent with the evidence that government transfers result in some individuals increasing their drug consumption at the beginning of the month. The reduction in revenue generating crime is consistent with some SSI and DI recipients supplementing their aid checks with income from crime.

Our results suggest that it is worth exploring the possible benefits of alternate means of disbursing aid. One policy option is to distribute the total monthly payments in

smaller but more frequent increments to each individual. In addition to reducing the cycle in adverse events, this might also reduce the level of adverse events by reducing drug bingeing. Because many jurisdictions have shifted to electronic benefits transfer (EBT), this could be relatively low cost to implement. Another possible policy would target the small subset of aid recipients that account for a disproportionately large share of substance abuse. Switching this population from cash aid to in-kind aid might reduce both the cycle and the level of drug related arrests, hospitalizations and deaths.

The paper is organized into six sections. Section II provides a description of the major government transfer programs. Section III contains a survey of the literature on the relationship between government programs and drug consumption. Section IV describes the hospital data, Medi-Cal records, mortality records and arrest data used in the analysis. In Section V, we present our results. Section VI discusses alternative policies for aid disbursement and Section VII concludes.

II. Description of Federal, State and Local Cash Aid Programs

The major federal cash aid programs include Social Security Disability Income (DI) and Supplemental Security Income (SSI). State programs include "welfare" (AFDC or TANF), a state supplement to SSI referred to as SSI/SSP, Unemployment Insurance and Workers' Compensation. Most California counties also disburse cash aid under General Relief and county indigent programs. In this section, we summarize the eligibility criteria, the amount of cash aid, and the timing of disbursement for recipients in California.

Social Security Disability Income provides partial income replacement for individuals who are unable to engage in "substantial gainful activity" for at least 12 months. The replacement rate varies by income and the number of dependents. For example, a 50 year old disabled worker in 1996 would have a 50% replacement rate if (s)he previously had annual earnings of $17,844, but a 40% replacement rate on $35,604 annual earnings (Bound and Burkhauser, 1999). If the recipient has a spouse and one child, the rates would be 75% and 60%, respectively. The size of the income replacement may be reduced if the person also receives certain other types of disability or workers'

compensation. DI recipients are allowed to earn limited employment income and maintain their benefits.[2] All DI recipients become eligible for Medicare after a 2 year waiting period, and we use this feature to identify long-term DI recipients in our data.

Supplemental Security Income / State Supplementary Payment (SSI/SSP) is a cash payment program to support the low income aged, blind and disabled. About two-thirds of California's approximately one million recipients are disabled. SSI/SSP is a means-tested program that provides benefits averaging slightly over $600/month for individuals and $1100 for couples during our sample period (California Department of Social Services, 2003). In a study using 2002 program data, the California Department of Social Services finds that the average length of time spent on SSI/SSP is 9 years, with two-thirds of recipients staying on the program more than 5 years. Less than 1% of SSI/SSP recipients receive earned income and this is at least partially due to the program imposing a high effective marginal tax on earnings. Therefore, it is unlikely that these recipients have other significant sources of income with an arrival date that may affect cash holdings.

Prior to 1997, substance abuse was classified as an impairment that qualified individuals as disabled and potentially eligible for both DI and SSI/SSP. In 1993, over 20,000 recipients of SSI/SSP in California were considered disabled due to substance abuse (Legislative Analyst's Office, 1995). Recipients were required to be in treatment and cash aid was sent to a "representative payee" who, in principle, was responsible for ensuring that aid was not spent on drugs and alcohol. However, the representative payee was often a friend or family member, and the conventional wisdom was that many recipients were able to control the funds (see Gresenz et al., 1998). In 1995, 25% of California substance abusers were estimated to be on SSI (Barber, 1996). The Welfare Reform Act of 1996 removed drug and alcohol addiction as a stand-alone qualification to receive disability benefits, although the act included provisions for recipients to be reevaluated for other mental illness that would qualify the recipient for benefits. This

[2] Beginning in 1998, recipients can earn up to $500/month without being classified as "gainfully employed", and a trial work period of up to 9 months is permitted without losing eligibility status.

rule change likely had a larger affect on the SSI than on the DI program (Bound and Burkhauser, 1999).[3]

The program commonly referred to as "welfare" was formerly known as Aid to Families with Dependent Children (AFDC), and is now known generally as Temporary Aid for Needy Families (TANF) or, in California, as California Work Opportunity and Responsibility for Kids (CalWORKs). The exact amount of cash assistance to a particular type of family varies by county and over time. In 1997, a family in California with no income received between $538 and $565/month depending upon whether the family lived in a high cost or low cost county (Geen et al., 1998).

Counties were required by the state of California to provide General Relief to all indigent residents who do not qualify for welfare. The average monthly grant to families averaged over $400 until 1996 when it was reduced to just over $200. The average grant to an individual was over $200 for most of our sample period (California Statistical Abstract, 1999). Other cash benefit programs such as Unemployment Insurance and Workers' Compensation distribute benefits based upon several possible schedules including on a bi-weekly schedule.

For each of these programs, the timing of the disbursement is critical for our analysis. SSI/SSP program participants receive their cash support on the 1st of the month, or the last business day of the previous month if the 1st occurs on a weekend. In most counties, welfare checks are mailed so as to be received by the 1st. However, there are several exceptions, most notably Los Angeles County which accounts for approximately one-third of welfare recipients statewide. In June 1997, Los Angeles County switched from a 1st of the month disbursement to a staggered disbursement over the first 10 days of the month.[4] We exploit this policy change in our empirical strategy below to test for the causal impact of aid disbursement. Finally, DI recipients who qualified before May 1997 receive their payment on the 3rd of the month; recipients qualifying after May 1997 receive their payment on the second, third, or fourth Wednesday of each month depending upon their date of birth. Because we can only indirectly identify DI recipients

[3] We should note that evidence of strong monthly drug cycles that we document in section V is present in our data both before and after the time of welfare reform.

[4] Also during our sample period, Fresno County disbursed welfare checks on the 1st, 5th, 10th, 15th, 20th and 25th day of each month depending on the date of birth.

as those non-elderly covered by Medicare and the fact that Medicare coverage begins two years after the disability, most of the DI recipients we can indirectly identify in our sample receive their payments on the 3rd of the month.

III. Literature on Cycles in Drug Consumption

A variety of papers have presented either direct or indirect evidence of the existence of a monthly cycle in drug use and hospitalizations, particularly for cocaine. Cycles for other drugs are less well documented, possibly because they are less pronounced and therefore harder to identify with small datasets. There is very little evidence as to how much particular government transfer programs contribute to the cycle because the studies with large representative samples of hospital admissions lack information on which government transfers the study's population is receiving. The few studies with information on their subjects' receipt of government transfers are typically examining a small, homogenous, and severely drug dependent population.

Several large-scale studies find evidence of an increase in drug related adverse events in the beginning of the month. Phillips et al. (1999) examine all death certificates between 1983 and 1988 and find that there are 1% more total deaths in the first week of the month than in the last week, but 14% more deaths from substance abuse in the first week. The paper speculates that the cause could be the additional availability of funds at the beginning of the month, but the authors cannot test for causes of the cycle because the mortality records have no information on government transfers. Halpern and Mechem (2001) examine all psychiatric illness admissions to the emergency department of the Hospital of the University of Pennsylvania for seven years. They compare the monthly pattern of admissions for psychiatric illness patients with substance abuse to all other psychiatric illness patients. They find that 34% more patients with substance abuse disorders were admitted in the first versus the last week of the month, while only 6% more patients without substance abuse disorders were admitted the first week. Riddell and Riddell (2006) study drug overdose patterns of about 2500 injection drug users at a large hospital in Vancouver in 1995-96. The patients are likely to be recipients of some form of cash assistance, however the patient records cannot be linked to data on social

assistance. The paper finds that injection drug users are more likely to leave the hospital against medical advice on the day that checks arrive, and more likely to overdose in the days following check arrival.

Most other studies focus on small samples of subjects with severe mental illness or histories of drug abuse. These studies provide insight into the behavioral response of populations with severe drug problems to the receipt of government transfers. These studies suggest possible causal mechanisms for the general population. Shaner et al. (1995) studied 105 schizophrenic cocaine dependant male veterans with long histories of psychiatric hospitalizations. These veterans received disability payments on the first of the month. After an initial hospitalization, the patients returned once a week for 15 weeks for psychiatric tests and to have their urine tested for indicators of cocaine use. The subjects had the highest level of the cocaine metabolite benzoylecgonine during the first three days of the month followed by a peak in hospital admissions three to five days later. Other studies also analyze the "full wallet" effect on small subpopulations including Rosenheck and Frisman (1996), Watkins and Podus (2000), Swartz et al. (2003), Rosenheck (2000), Samet (2001), Maynard and Cox (2000), Catalano et al. (2000), and Catalano and McConnell (1999). These studies suggest that among recipients with severe drug addictions, "full wallets" may trigger drug consumption. However, these studies do not reveal which programs are driving the overall cycle in drug related hospital admissions.

As we discuss in the introduction, studies have found that recipients of public aid do not smooth consumption. Shapiro (2005) investigates cycles in the use of public aid by food stamp recipients. He finds that daily food consumption measured in both dollar value and calories declines in the number of days since the receipt of food stamps. Shapiro claims that much of the cyclicality results from substantial discounting of future consumption. Stephens (2003) finds similar evidence against consumption smoothing among Social Security recipients. In the days immediately after checks arrive, households increase expenditures on instantaneous consumption items such as food away from home, entertainment and recreation, and fresh foods. This effect is strongest for recipients who depend upon Social Security for the majority of their income.

Our paper is also related to the more general investigation of the Life-Cycle/Permanent Income Hypothesis. An extensive literature has exploited various events that lead to anticipated income shocks in order to test if individuals smooth consumption in response to these shocks.[5] The results regarding so-called "excess sensitivity" are somewhat mixed. However, Cochrane (1989) illustrates that utility losses from violations of consumption smoothing can be quite small in practice. See Browning and Lusardi (1996) and Browning and Crossley (2001) for an interpretation of recent empirical findings. Our paper also examines the cycles in specific crimes associated with drug consumption. Although there are numerous studies of the causes of the long term variation in crime rates (see Levitt (2004) for a recent summary), little research has investigated what drives the short term variation in crime.

IV. Data

We assemble data from several sources to measure and evaluate the effects of monthly cycles in drug and alcohol consumption. We gathered individual level records on hospital admissions, Medi-Cal (Medicaid) eligibility, death certificates and arrest records.

Our hospital admission data cover patients admitted to California hospitals from 1994-2000.[6] Patients who are admitted to the hospital are assigned a code for their primary cause of admission (ICD-9 code) as well as up to 24 codes for other conditions.[7] We classify an admission as drug or alcohol related if any of the 25 diagnosis codes indicate substance abuse. In addition, the data contain patient-level demographic characteristics and information on the expected source of payment. The hospital

[5] Examples of such events include bargained union wage changes (Shea, 1995), income tax refunds (Souleles, 1999), Social Security taxes (Parker, 1999), semi-annual bonuses (Browning and Collado, 2001), annual payments to Alaskans from the Alaska Permanent Fund (Hsieh, 2003), tax rebates (Johnson, Parker and Souleles, 2004), paycheck receipt (Stephens, 2006), the final payment of a car loan (Stephens, 2005), and anticipated and unanticipated household energy costs (Cullen, Friedberg and Wolfram, 2004).

[6] These files contain individual records for every admission to hospitals regulated by the California Office of Statewide Health Planning and Development (OSHPD). The only hospitals excluded are federally regulated hospitals. The data are maintained by the California Department of Health Services.

[7] The codes used in California in this period are the International Classification of Diseases 9th Revision (ICD-9). These codes identify drug or alcohol dependence/psychosis, and often specifically identify the substance.

discharge data are linked to Medi-Cal eligibility data. Medi-Cal eligibility codes provide information on program eligibility including cash assistance programs such as AFDC/TANF/CalWORKs (or "welfare") and Supplemental Security Income and the State Supplementary Payment Program (SSI/SSP).[8] We can directly identify patients eligible for welfare and SSI, and we indirectly identify DI recipients as substance abuse patients under age 65 who are covered by Medicare.

Drug related hospital admissions are common. Table 1 presents summary statistics on patients' age, length of stay, insurance status and cash aid receipt. There are a considerable number of cocaine, heroin and amphetamine related admissions though they are dominated by alcohol related admissions. In approximately 15% of admissions in which drugs are mentioned, the patient has sustained an injury. More than 30% of the admissions with a drug mention are for patients who receive cash aid from the state or federal government. This is largely due to SSI disability recipients who have a much higher per capita rate of drug related admissions than any of the other groups we can directly identify. Though SSI disability recipients account for only 9.3% of overall hospital admissions, they account for 25.5% of drug related admissions.

The hospital data only allow us to observe deaths that occur within the hospital. To remedy this problem, we use death certificates from the California Department of Health Services to determine if there is a cycle in deaths outside the hospital. The death certificate records cover the 1994 to 2000 period and include demographic information on the decedent and detailed information on the cause of death. Unfortunately, these records lack information on coverage by government transfer programs.

To examine the monthly cycle in crime, we use arrests records for the 1993-1999 period from the Uniform Crime Reporting Program of the California Department of Justice. These records include the date of arrests, the most serious crime the arrestee is charged with, and limited demographic information. These records lack information on the arrestees' receipt of government transfers.

[8] The other major categories of cash assistance programs falling under Medi-Cal are Foster Care and Adoption Assistance and Refugee Cash Assistance, but these programs are substantially smaller than welfare and SSI/SSP.

V. Results

The results are divided into five sections. In first section, we document the existence and magnitude of the monthly cycle in cocaine, heroin, amphetamine and alcohol related hospital admissions. In the second section, we determine which government transfer programs are driving the cycles in hospital admissions. In the third section, we present additional evidence that the cycle in hospital admissions is caused by government transfers and that a staggered disbursal schedule smoothes the cycle in admissions. In the fourth section, we examine the impact of government transfers on mortality. In the fifth section, we document the monthly cycle in crime.

V.1. Measures of the Monthly Cycle in Drug Related Hospitalizations

Using a census of admissions to California hospitals, we calculate the average number of drug and alcohol related admissions for each day of the month. Figure 1 shows average daily admissions with a mention of either drug or alcohol use. These averages are plotted over the number of days from the first of the month (i.e. Day 0 is the first of the month, day 1 is the 2nd of the month, and Day -1 is either the 31st, 30th, 29th or 28th depending upon the month). Figure 1 reveals a pronounced monthly cycle in hospital admissions with a mention of cocaine, heroin and amphetamines and a weaker cycle in admissions with a mention of alcohol.[9] The cycles peak between the fifth and seventh day of the month for each substance. Admissions steadily decline in the weeks after the peak. Cocaine admissions have the most pronounced cycle with a peak on the fifth day of the month almost 37% above the level on the first day of the month. Amphetamine admissions have a slightly less pronounced cycle and peak a few days later. Heroin has the least pronounced cycle. It is possible that the differences in the cycles are due to differences in the populations consuming the drugs or in the pharmacological effects of the drugs.

[9] We have examined the monthly cycle of admissions for primary and secondary cause of admission separately, and the patterns are very similar.

V.2. Causes of the Monthly Cycle in Drug Related Hospitalizations

A variety of factors could cause the observed cycle in drug and alcohol related admissions. One possibility is that the early month disbursement of cash aid creates "full wallets" at the beginning of the month that exacerbate substance abuse problems. But other factors could also create such a cycle. For example, the frequent occurrence of weekends or holidays at the beginning of the month could create this pattern. Also, the cycle could be driven by the cycle in paycheck receipt. Another possible cause is a monthly cycle in drug supply. However, we find strong evidence that the timing of cash aid disbursement is driving the cycle.

The cycle is unlikely to be caused by increased drug consumption on the weekend because the weekends are fairly evenly distributed over the month when we average over seven years of hospital admissions. However, it is plausible that certain early month holidays (e.g. New Year's or July 4th) or late month holidays (e.g. Thanksgiving or Christmas) could contribute to the monthly cycle, though this explanation is inconsistent with the smoothness of the cycle in admissions. However, as a direct test of this possibility, we created a figure (not shown but available on request) where the average daily admissions are regression adjusted for the day of the week and major holidays. This figure is very similar to Figure 1.

Our data on Medi-Cal eligibility allow us to identify patients who receive various forms of cash aid. Table 1 presents counts and rates of alcohol and drug related admissions for welfare recipients, SSI recipients and the total population. SSI recipients in the disability category account for many more admissions than welfare. SSI recipients also have a much higher rate of alcohol and drug admissions than welfare recipients. However, it is worth noting that the majority of admissions are for people covered by neither program.

SSI recipients significantly contribute to the total monthly cycle. Figure 2 shows the monthly cycle in drug related admissions broken out into three categories: welfare, SSI and other. SSI recipients exhibit a much stronger cycle in admissions than either of the other groups with a peak on the fifth of the month that is 50% above the level on the first of the month. Given that the SSI recipients typically have very little earned income,

the cycle is likely to be driven by the receipt of cash aid on the first of the month. These results suggest there is a strong "full wallet" effect among SSI recipients. Welfare recipients show a weaker cycle with a peak on the third of the month that is 18% above the level on the first day of the month. The weaker cycle may be partially due to the fact that for part of the period we examine, welfare recipients in Los Angeles County receive their checks over the first 10 days of the month rather than on the first of the month. The residual group also shows a cycle with a peak on the sixth of the month that is 15% above the level on the first of the month.

It is important to examine this residual group because it contains people who are covered by programs such as Disability Insurance (DI) and General Relief. Although we cannot directly identify patients covered by these programs, we can infer their status based on their health insurance. Drug patients covered by DI for more than two years are likely to be under 65 and covered by Medicare. The General Relief recipients are likely to be covered by Medi-Cal or County Indigent programs. Figure 4 shows the monthly cycle in drug admissions by primary insurance coverage for those receiving neither SSI nor welfare. The cycles in admissions for patients covered by Medi-Cal and County Indigent programs are much less pronounced. However, there is a very pronounced cycle for Medicare recipients with a clear jump after the third of the month which is when the DI checks arrive for the majority of DI recipients in our sample. The fact that the admission surge for this group begins after the 3rd rather than the 1st provides further evidence that cycles are caused by aid disbursement rather than other factors unique to the first of the month.

It is unlikely that the aggregate monthly cycle is substantially driven by paycheck receipt at the beginning of the month. First, as seen in Figure 2, a large fraction of the cycle is driven by SSI recipients who receive very little earned income. Also, we can use private insurance (e.g. PPO, HMO) as a proxy for being employed. Figure 4 shows that there is very little evidence of an increase in early month admissions for people with private insurance. Finally, the monthly pattern of admissions is not consistent with the monthly pattern in paycheck receipt. Skiba and Tobacman (2005) report the prevalence of pay frequencies among individuals in a proprietary dataset from a financial services

company.[10] Their dataset includes individuals who sought payday loans, so people with longer pay periods and lower incomes are likely to be overrepresented. The paycheck frequencies are presented in Figure 3 which reveals that paychecks are most commonly received on the days surrounding the 1st of the month and on the 15th of the month. However, the monthly cycle for those not on welfare nor SSI does not exhibit much evidence of a surge in admissions after the 15th, which one would expect if paycheck receipt induced significant numbers of drug admissions.

Any cycle in hospital admissions induced by the personal income of government transfer recipients is likely to be small because their personal income is small. Table 2 documents the average personal and family income for welfare, SSI and Medicare recipients in California from the March 1997 CPS. As can be seen in Table 2, SSI and welfare recipients have little earned income. The CPS does not allow us to separate DI from other Social Security payments, but total Social Security payments comprise a large share of personal income for those likely to be receiving DI (the non-elderly covered by Medicare). Because cash aid recipients have low levels of earnings and these earnings do not all arrive at the beginning of the month, it is likely that these earnings make only a small contribution to the monthly cycle.

The differing monthly patterns for various subsets of the population suggest that supply side factors are unlikely to drive the monthly cycle. If drugs are generally more available at the beginning of the month, one might expect consumption to increase across all subsets of the population. However, patients not receiving cash aid comprise a large fraction of admissions yet do not exhibit a monthly cycle. We present further evidence against supply-side explanations below when we analyze a change in the timing of disbursement for welfare in Los Angeles County.

Monthly cycles in alcohol related admissions exhibit similar patterns to drug admissions. Figure 5 shows that the monthly cycle for alcohol admissions is particularly strong for SSI recipients and weak for welfare recipients and all other patients.

Not only do hospital admissions exhibit a cycle, but hospital *exits* also exhibit a monthly cycle. Figure 6 presents the daily discharge rate of patients admitted for drug related reasons. For SSI and welfare recipients, the pattern is relatively uniform across

[10] We thank them for permission to reproduce those frequencies here in Figure 3.

the month except for an increase in exits the last two days of the month and the first day of the (next) month which is when checks typically arrive. This increase in discharges is particularly large for SSI recipients who have a discharge rate on the first of the month that is 20% higher than the discharge rate on the three prior days.

This increase in exit rates is even more striking when we restrict our sample to patients who exit against medical advice. As seen in Figure 7, the increase in fraction of patients leaving the hospital against medical advice rises dramatically on the first and last days of the month. Riddell and Riddell (2006) find a similar pattern among injection drug users in Vancouver. It is difficult to interpret this phenomenon without further evidence, but the pattern is at least suggestive that exit patterns are causally related to the disbursement of cash aid. Patients may voluntarily leave the hospital knowing they are about to receive more cash, or they may feel the need to leave so as to ensure they receive their cash aid.[11]

V.3. Will Smoothing Cash Aid Disbursement Smooth the Monthly Cycle?

The surge in drug related hospital admissions occurring immediately after aid recipients with very low earnings receive their transfer checks strongly suggests a causal relationship. As a more direct test of the hypothesis that check arrival is driving the increase in hospital admissions, we examine an abrupt change in the timing of the disbursal of welfare checks that occurred in Los Angeles County.

Ideally, we would like to observe a change in the timing of disbursement for SSI, the program that drives the majority of the monthly cycle. Unfortunately, there were no changes in SSI check disbursal in the period we examine. But there was a change in welfare disbursement that we can exploit. In California, welfare is managed at the county level. In the middle of our sample period, Los Angeles County, which accounts for approximately one-third of the state's welfare recipients, changed its disbursal schedule. Prior to June 1997 in Los Angeles, AFDC/TANF/CalWORKs aid was disbursed on the first of the month. Since June 1997, the majority of the LA County controlled cash aid programs (CalWORKs, Refugee Cash Assistance, General Relief, and Cash Assistance

[11] There is anecdotal evidence that some aid recipients fear people will steal their checks.

Program for Immigrants) switched to disbursing aid to individuals based upon a designated stagger day, spread over the first ten days of each month. Each recipient may pick up benefits at the contracted issuance outlet any day of the month after his/her designated stagger day. Recipients typically claim their benefits on their designated day.

We analyze the effect of the disbursement change on the cycle of drug admissions among welfare recipients in Los Angeles County. If welfare disbursement is affecting the cycle, a switch from Day 1 disbursement to Day 1-10 disbursement should shift the peak several days later in the month and smooth the cycle. We test for such a change by comparing the monthly cycle pre and post June 1997. We find that the post June 1997 drug admission cycle of welfare recipients in LA County exhibits a statistically significant shift to later in the month.[12] Also, we make a similar comparison for other large counties pre and post June 1997. We fail to find a significant change in the monthly cycle of drug related admissions in those counties. This suggests that other state-level changes related to either drug policy or welfare programs are not driving the shift in Los Angeles County.

We measure the effect of the change in disbursement policy by analyzing the relative number of early month versus middle of the month drug related admissions. For each month between January 1994 and November 2000, we calculate the ratio of the number of admissions by welfare recipients on days 2-9 to the number of admissions on days 10-17. If the day 1-10 staggered disbursement shifts the peak of admissions to later in the month, this ratio will fall after June 1997.

We analyze the effect in a regression setting and the results are shown in Table 3. We regress each month's ratio of days 2-9 admissions to days 10-17 admissions on a constant and dummy variable for Post-June 1997. In the first column, we find that before June 1997, there are 15% more admissions in the early part of the month (days 2-9) than in the middle of the month (days 10-17). After June 1997, the differential is essentially eliminated as indicated by the -0.17 coefficient on the Post-June 1997 dummy variable. The statistically significant reduction in the ratio implies a change in the monthly pattern that is consistent with reducing the full wallet effect in the first few days of the month.

[12] Although the change in disbursement also affected other programs including General Relief, Refugee Cash Assistance and Cash Assistance Program for Immigrants, we do not include these programs because we do not observe individual's eligibility for these programs.

Note that any factors that affect the overall monthly level of welfare recipient admissions (e.g. time trend in number of welfare recipients or seasonality of drug consumption) are factored out by taking each month's ratio of early to mid-month admissions. However, one may be concerned that a disproportionate number of weekend days occur in early versus middle days of a particular month. In column 2, we control for the month's ratio of weekend days during the early and middle part of the month, and the coefficient estimate of Post-June 1997 in unchanged.[13] Column 3 controls for months with specific holidays by including month effects and again the coefficient estimate is unchanged.

We also examine the possibility that the reduction in LA County's early month admissions after June 1997 is caused by factors such as statewide changes in welfare policy or changes in drug supply or drug interdiction policies. To do this, we use the ten largest counties other than LA as our comparison group. If the observed shift in LA County's cycle is driven by these confounding factors, we should observe a shift in the cycle in the other large counties as well. In Table 3, the fourth through sixth columns report results for the above tests applied to the other large counties. In these other counties, the early days of the month have more drug related hospital admissions than the middle of the month, however this pattern does not change after June 1997. In all three specifications, the coefficient of the Post-1997 dummy variable is nearly zero and not statistically significant.

To examine the possibility that the changes in drug related hospital admissions among welfare recipients in Los Angeles County are due to local changes in either the supply or demand side of the drug market, we check for changes in the cycle of admissions for SSI recipients. In columns 7 through 9, we test whether LA County drug admissions among SSI recipients changed after June 1997, and find a very small coefficient that is not statistically significant. This suggests the changes in admissions patterns we observe among welfare recipients in Los Angeles are not due to supply side changes in drug markets.

[13] Note that the constant (which represents the base period's ratio) will change when we add covariates because the base period is changing. The parameter of interest is the Post-June 1997 dummy variable which measures the change in the ratio relative to the base period.

This analysis of the change in LA County's welfare disbursement offers evidence that the relationship between the disbursement of cash aid and drug consumption is causal. Note that the welfare population that we examine has only a small monthly cycle in drug related admissions (as compared to SSI, for example). As a result, our test of the null hypothesis that there is no change in the cycle is a fairly low power test, yet we reject the null. Therefore, we view our findings of a statistically significant shift as evidence that changing the timing of disbursement will change the timing of drug consumption by cash aid recipients with substance abuse problems.

V.4. Monthly Cycles in Mortality

We also find evidence of a distinct monthly cycle in within hospital mortality among SSI recipients. Figure 8 shows average daily number of deaths due to all causes that occur within the hospital by type of cash aid program. The means have a regression line superimposed. The regression includes a quadratic polynomial in days from the beginning of the month fully interacted with an indicator variable that takes on a value of 1 for admissions occurring between the 1st and the 14th of the month. To increase precision, the regression is fitted to the underlying daily observations rather than the means presented in the figure. An examination of the figure reveals that the second order polynomial fits the data well. The figure reveals a striking increase in within hospital deaths per day among SSI recipients and little evidence of an increase in deaths for either welfare recipients or people who receive neither welfare nor SSI. In Table 4 we present the regression discontinuity estimates corresponding to the lines in Figure 8. The first panel presents the results for welfare recipients. The first column of this panel corresponds directly to the regression line for welfare recipients in Figure 8. The coefficient estimate for "RD on 1st of Month" reveals that there is no statistically significant increase in mortality for welfare recipients. In the second column we add dummies for day of the week, month and year. In the third column we add dummies for the major holidays. All the results in the table are robust to the inclusion of these covariates. In the second panel we present the results for recipients of SSI disability. The

disability recipients experience about a 22% increase in mortality on the first of the month. People that receive neither welfare nor SSI do not experience a statistically significant increase in mortality at the beginning of the month.[14]

Deaths within the hospital account for less than half of the deaths occurring in California in this period. For this reason we use the vital statistics records to examine the overall pattern of deaths. Unfortunately, we cannot identify SSI recipients in the death certificate records. In Figure 9 we present average deaths per day in California split by whether the death is due to external or internal causes. The external causes of death category includes: deaths due to drug overdoses, falls, motor vehicle accidents, suicide, and a variety of other causes. These causes of death are more likely to be the result of drug consumption or changes in behavior that result from drug consumption than deaths due to internal causes. Figure 9 shows evidence of a significant increase in external deaths at the beginning of the month and evidence of smaller increases in deaths due to internal causes. The top two panels of Table 5 present the regression estimates corresponding to Figure 9. The regressions confirm that the increase in external deaths is statistically significant though it represents only an approximately 4% increase in external deaths. The increase in internal deaths is only about .5% and is not statistically significant. The lower panels of Table 5 break out the external causes of death into more refined subgroups. This exercise reveals that the increase in external deaths appears to be largely due to increases in alcohol/drug overdoses, motor vehicle accidents and suicides (though the increase in suicide deaths is not statistically significant and the increase in motor vehicle accident deaths is not statistically significant in the final specification). We cannot directly attribute the overall increase in mortality outside the hospital to changes in the behavior of SSI recipients at the beginning of the month because program coverage is not recorded on the death certificate. However, the striking increase in non fatal drug and alcohol related hospital admissions and within hospital deaths among SSI recipients suggest that a significant proportion of the early month increase in deaths outside the hospital is due to changes in the behavior of SSI recipients after they receive their checks.

[14] It is possible that there are increases in deaths for DI and General Relief recipients, but we do not observe them because these groups are small relative the rest of the population with which they are included.

V.5. Monthly Cycles in Crime

We now examine the monthly cycle in crime. As we state above, our data do not include whether a particular arrestee is covered by a government transfer program. However, given that the cycle in drug related hospital admissions is largely driven by government transfers, it is likely that any cycle in arrests related to drug consumption is due largely to government transfers. We examine arrests for two categories of crimes: drug crimes and property crimes. Government transfers are likely to have different impacts on these different crime types. Drug crimes, particularly drug possession, are likely to increase as people with substance abuse problems have more money to spend. Property crime is likely to decrease after the checks arrive if drug addicts that are low on cash at the end of the month use crime to support their drug habits.[15]

Figure 10 presents the average number of daily arrests for drug possession or sale with a regression line superimposed. The figure reveals an abrupt increase in arrests for drug possession and sale at the beginning of the month. Unlike the drug related hospitalizations, drug arrests rise immediately on the first of the month. The increases range from about 9% for cannabis arrests to about 20% for the "Narcotics" arrests (which is largely heroin and cocaine possession and sale). The number of arrests for all the groups then declines slowly through the month. This is consistent with an abrupt increase in purchases of drugs when cash aid checks arrive at the beginning of the month followed by a decline in purchases as people run out of money. Though we have no direct evidence on the aid programs that arrestees are covered by, we saw that the cycle in adverse events was driven in large part by SSI. Given that SSI checks arrive on the 1st of the month, this suggests SSI is one of the primary drivers of the cycle in arrests. It is worth noting that the arrests for drug possession rise far more abruptly than do hospitalizations. One possible explanation is that though drug purchasing begins as soon as the check arrives, it takes some time for people to take a sufficient amount of a drug to have an adverse event that results in hospitalization or death.

[15] The arrival of checks could also increase the opportunity to steal money, and we see slight evidence of this phenomenon in our robbery results below.

Table 6 contains the regression discontinuity estimates of the increase in arrests for drug possession or sale on the first of the month. The regression in the first column of each panel corresponds to the appropriate regression line in Figure 10. The second and third columns show additional specifications of the regression that adjust for the day of the week, month, year and holidays. Given the strong weekly and seasonal cycles in crime, it is not surprising that the inclusion of covariates increases the precision of our estimates. The point estimates are fairly robust to the inclusion of the covariates with the exception of the holiday dummies. An examination of the underlying data suggests that this is due to significant changes in arrest patterns on New Years Eve. The first panel presents estimates of the overall cycle in crime (figure not shown). It reveals a statistically significant 7% increase in overall arrests in the beginning of the month. The remaining regressions confirm the statistical significance of the regression discontinuities visible in Figure 10. The increase in "Narcotics" arrests on the first of the month represents a 20% increase over the number of arrests on the last day of the month and is statistically significant. Arrests for "Dangerous Drugs" (largely methamphetamine possession and sale) jump by about 19% on the first. The results are all statistically significant at conventional levels with most of the t-statistics greater than 5.

Figure 11 illustrates the monthly cycle in arrests for revenue generating crimes. There is evidence of an abrupt decline in prostitution arrests at the beginning of the month, smaller declines in burglary and robbery arrests, and little evidence of declines in any of the other crimes. The decline in prostitution arrests is particularly interesting because drug use is very common among prostitutes.[16] Drug testing of women arrested for prostitution in three major California cities revealed that in the 3-5 days before arrest, 80% had used cocaine, 8% had used heroin and 5% had used methamphetamine.[17] Approximately 20% of these women reported SSI or welfare as there primary source of income. The decline in prostitution arrests is consistent with the arrival of transfer checks reducing prostitutes' need for cash to support their drug habit.

[16] Note that if cash aid created more demand for prostitution from "johns", we would expect prostitution to decrease at the end of the month and increase after cash aid arrives. These results suggest that the supply side effect dominates any demand side effect.

[17] The women tested are a non random sample of women arrested in San Jose, San Diego and Los Angeles and drug tested as part of the ADAM/DUF program.

Several complications arise in estimating and interpreting the cycles in revenue generating crimes. Unlike arrests for drug possession, arrests for revenue generating crimes, other than prostitution, often occur days or weeks after the commission of the crime. This lag will partially mask abrupt changes in the rates at which revenue generating crimes are committed. An additional difficulty with estimating the cycle in arrests for revenue generating crime is that there are two conflicting mechanisms at work. Though the check's arrival reduces an aid recipient's need to supplement his or her income by committing crimes, it also increases the incentives for people to rob the aid recipients. We see some evidence of this in the data. Figure 11 reveals what appears to be an increase in robberies on the day the checks arrive followed by a reduction in robberies in the following weeks.[18] It is possible that for this particular crime, we are seeing these two opposing mechanisms at work.

Table 7 presents the regression discontinuity estimates of the changes in arrest rates for revenue generating crimes. The estimates are somewhat sensitive to the inclusion of holiday dummies. The regressions reveal a statistically significant 16% decrease in prostitution and a 3% decrease in burglary arrests. The regression results for robbery arrests do not reflect the decline that we observe in Figure 11, and this appears to be due to the peculiarly high arrests rates for robbery on the first of the month. The decrease in arrests for revenue generating crime only partially offsets the large increases in drug related arrests. As shown in Table 6, overall there is a 7% increase in arrests on the first of the month.

VI. Policy Implications: Alternative Policies for the Disbursement of Cash Aid

We have presented evidence that for a particular subpopulation, the receipt of government transfer checks causes a large, abrupt increase in the probability of a drug related hospitalization, arrest or death. The 22% increase in the death rate of SSI recipients is particularly striking. It is worth exploring the possibility that alternate disbursement regimes will reduce both the cycle and the levels of these adverse events.

[18] Arrest for thefts are also above their trend on the first day of the month. An examination of the underlying data does not reveal that this increase on the first of the month is due to a New Years effect.

One possible alternative disbursement scheme is to make several small transfers throughout the month rather than a single large one. For example, the monthly aid could be divided into weekly or biweekly payments. This would reduce the prevalence of full wallets at the beginning of the month and would likely smooth the overall monthly cycle in hospital admissions, deaths and crime. Reducing the amount of money each individual receives at any given time may also reduce the number of hospitalizations and deaths if it reduces binging. Although we have no evidence on the effects of high frequency disbursement, if this disbursement scheme were to reduce the average level of drug related hospital admissions to the rate we observe for aid recipients in the latter half of each month, the benefits could be considerable. The 1996 welfare reform act required states to convert to electronic benefit transfer (EBT) by 2002. This should make the policy relatively inexpensive for the state administered programs to implement. However, the design of such staggered disbursement schemes needs to take into account recipients' needs such as the ability to pay bills and rent at the beginning of the month.

A second possible policy is to substitute in-kind aid for cash aid for individuals with severe drug related problems. Such policies have been proposed in the past. Most recently in November 2002, San Francisco passed the "Care Not Cash" initiative that reduces General Assistance cash aid from approximately $320 to $59 and converts the difference to in-kind support of food and housing. Since this disbursement scheme could be expensive to implement, it would be particularly effective to carefully target recipients with a history of severe substance abuse problems. In Table 8 we document the number of times that particular recipients are admitted with a drug mention during the period 1994-2000. Table 8 reveals that a very small number of recipients account for a disproportionately large number of drug admissions, particularly among SSI and DI recipients. Among the nearly 45 thousand SSI recipients who are ever admitted with a drug related diagnosis, 19 thousand (43%) are admitted more than once with drug related conditions over the seven year period. The 1,004 SSI recipients that are admitted to the hospital more than 11 times account for 16 thousand (or 16%) of the SSI admissions. DI patients (proxied by Medicare) exhibit similar frequencies. 11 thousand of nearly 28 thousand DI patients (41%) are admitted more than once with a drug related diagnosis; 681 patients are admitted more than 11 times and comprise 17% of DI admissions. By

contrast, only 4 thousand of 27 thousand welfare patients (16%) are admitted more than once, and only five recipients are admitted more than 11 times. The DI recipients with repeat admissions generate similar patterns in hospital charges.

These results suggest that it is worth testing alternative disbursement policies that could reduce drug bingeing. If they are effective, these policies could significantly reduce drug-related hospitalizations, arrests for drug possession, and mortality among SSI and DI recipients.

VII. Conclusions

This work complements the literature on consumption smoothing. Unlike previous work that has found limited evidence of utility or welfare losses, we find that surges in consumption of illicit drugs and alcohol can create serious problems. We present evidence that there is a pronounced monthly cycle in drug and alcohol related hospital admissions among participants in some government transfer programs. We also present evidence that SSI recipients experience a very large increase in within hospital mortality rates after they receive their transfer checks. Finally, we find a large increase in arrests for drug possession and sale and decreases in arrests for some revenue generating crimes. These results suggest that government transfer programs significantly affect the timing and possibly also the levels of drug related hospitalization, arrests and deaths.

Our results suggest that “fat wallets” can exacerbate impulse control problems; money, at least in certain quantities, can adversely affect some aid recipients. It is likely that distributing aid to recipients in smaller and more frequent payments or distributing the aid in-kind will smooth the cycle in adverse events. It is also possible that these alternate regimes, particularly the second, will reduce the number of drug related hospitalizations, arrests for drug possession, and drug related deaths. Evaluating the effectiveness of policy changes intended to reduce adverse drug related events is an area for future research.

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Table 1: Demographics by Hospital Admission by Type of Drug Mentioned on Admission Record

	All Admission	Alcohol	Heroin	Cocaine	Amphetamines
Primary Cause of Admission (based on ICD-9)					
External causes (Injury)	0.110	0.181	0.132	0.140	0.152
Infectious Disease	0.020	0.016	0.029	0.020	0.019
Respiratory Problems	0.069	0.051	0.062	0.045	0.029
Delivery	0.217	0.007	0.037	0.088	0.143
Circulatory Problems	0.152	0.079	0.046	0.075	0.046
Neoplasm	0.057	0.017	0.007	0.005	0.004
Alcohol or Drug Psychosis	0.005	0.073	0.134	0.102	0.077
Schizophrenic Disorder	0.013	0.032	0.015	0.066	0.062
Affective Psychosis	0.024	0.084	0.064	0.119	0.113
Nonorganic Psychosis	0.004	0.008	0.006	0.016	0.036
Alcohol & Drug Dependence	0.007	0.120	0.162	0.122	0.119
Other Mental Conditions	0.013	0.044	0.032	0.050	0.082
Hospital Stay					
Admitted Through ER	0.421	0.616	0.533	0.508	0.450
Length of Stay (in Days)	4.4	6.2	6.7	6.7	6.2
Charges (in Dollars)	17188.5	18072.8	15889.8	13769.1	13540.8
Left Against Medical Advice	0.011	0.060	0.122	0.096	0.075
Died	0.023	0.029	0.017	0.011	0.009
Insurance Coverage					
Medicare	0.332	0.268	0.174	0.168	0.124
Medi-Cal	0.203	0.185	0.274	0.290	0.305
Private	0.372	0.302	0.219	0.221	0.276
Self pay	0.037	0.116	0.106	0.123	0.130
County Indigent	0.024	0.075	0.106	0.081	0.078
Demographics of Patients					
Age (in Years)	50.7	47.8	41.2	37.3	32.5
Male	0.368	0.714	0.586	0.621	0.535
White	0.598	0.642	0.589	0.367	0.725
Black	0.088	0.121	0.156	0.430	0.058
Hispanic	0.227	0.197	0.222	0.168	0.169
Proportion of Patients Enrolled in Each Program					
Welfare	0.049	0.024	0.051	0.076	0.131
SSI aged	0.037	0.014	0.005	0.001	0.000
SSI Blind	0.004	0.002	0.002	0.003	0.001
SSI Disabled	0.093	0.191	0.273	0.281	0.196
Admissions per Month per 10K recipients					
Welfare Rate	48.176	0.983	0.486	0.628	0.810
SSI Aged Rate	238.799	3.816	0.294	0.065	0.019
SSI Blind Rate	323.026	8.502	2.139	1.937	0.825
SSI Disabled Rate	287.914	24.877	8.315	7.434	3.871
Total Admissions	18,249,548	763,500	178,970	155,275	115,815

Notes: Admissions records are included in the tables above if the drug is the primary cause of admission or if it is mentioned on one of the other ICD-9 CM codes. All the numbers are proportions unless otherwise labeled. The heroin category includes all opioids and the amphetamine category is largely methamphetamine. Charges and LOS are for the first unit the patient is admitted to.

Table 2: Size and Sources of Income by Program in 1997 for Californians Aged 20-47

	Program Individual Covered Under					
	Welfare/Public Assistance		SSI		Medicare	
Income Source	Personal	Family	Personal	Family	Personal	Family
Earnings	$1,900	$4,995	$1,489	$7,468	$3,437	$15,374
SSI	$266	$580	$5,842	$6,449	$1,113	$1,483
Social Security (including DI)	$418	$768	$2,415	$3,712	$4,373	$8,338
Unemployment and Workers Comp	$153	$302	$160	$202	$194	$471
Welfare/Public Assistance	$5,479	$6,199	$480	$1,013	$598	$924
Disability (excluding Social Security)	$32	$32	$330	$488	$642	$968
All other	$407	$509	$722	$1,528	$1,559	$4,136

Notes: In order to proxy the subpopulation that corresponds to the hospital admissions, we select individuals aged 20-57 which is the 5th and 95th percentile of the age distribution among the patients in the hospital admission data. The March CPS does not separate DI income from other Social Security income. Source: March 1997 Current Population Survey.

Table 3: Testing Effect of Change from Day 1 to Day 1-10 Disbursement for Welfare Recipients in Los Angeles County

Dependent Variable: Ratio of Admissions Days 2-9 to Admissions Days 10-17 for each Month

	Welfare Recipients - Drug Admissions in LA County			Welfare Recipients - Drug Admissions in Other Large Counties			SSI Recipients - Drug Admissions in LA County		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Constant	1.15	1.38	1.36	1.11	1.19	1.39	1.14	1.28	1.28
	[0.05]	[0.14]	[0.17]	[0.03]	[0.11]	[0.18]	[0.03]	[0.09]	[0.11]
Post-June 97 Dummy	-0.17	-0.17	-0.17	-0.01	-0.01	0.00	-0.01	-0.01	-0.01
	[0.06]	[0.06]	[0.06]	[0.05]	[0.05]	[0.05]	[0.04]	[0.04]	[0.04]
Ratio of Weekend Days		-0.23	-0.26		-0.08	-0.05		-0.14	-0.13
for Days 2-9 to Days 10-17		[0.13]	[0.15]		[0.11]	[0.11]		[0.08]	[0.08]
Month Effects	No	No	Yes	No	No	Yes	No	No	Yes
Observations	83	83	83	83	83	83	83	83	83

Notes: Newey-West standard errors in brackets. An observation is each month between January 1994 and November 2000. The dependent variable is the sum of county welfare recipients' drug-related hospital admissions for days 2-9 divided by the sum of admissions on days 10-17 of each month. Newey-West standard errors incorporate a lag of one month. 'The ten largest counties other than Los Angeles are Orange, San Diego, San Bernardino, Santa Clara, Riverside, Alameda, Sacramento, Contra Costa, Fresno and San Francisco.

Table 4: Regression Discontinuity Estimates of the Daily Number of Within Hospital Deaths in California 1994-2000

	Welfare			SSI Disability			Non Welfare Non SSI		
RD on 1st of Month	0.094	0.094	0.084	2.861	2.872	3.018	-2.528	-2.466	-2.649
	[0.129]	[0.126]	[0.126]	[0.625]	[0.545]	[0.515]	[4.297]	[2.868]	[2.482]
Days	-0.018	-0.018	-0.012	-0.266	-0.267	-0.285	1.012	1.01	0.894
	[0.035]	[0.034]	[0.034]	[0.161]	[0.140]	[0.139]	[1.112]	[0.729]	[0.669]
Days Sq	-0.001	-0.001	0.000	-0.015	-0.015	-0.016	0.044	0.045	0.036
	[0.002]	[0.002]	[0.002]	[0.011]	[0.009]	[0.010]	[0.074]	[0.048]	[0.047]
Days*Post	0.041	0.041	0.033	0.102	0.103	0.102	-1.386	-1.384	-1.096
	[0.042]	[0.042]	[0.041]	[0.195]	[0.171]	[0.170]	[1.316]	[0.854]	[0.819]
Days Sq*Post	-0.001	-0.001	-0.002	0.022	0.022	0.024	-0.027	-0.028	-0.032
	[0.003]	[0.003]	[0.003]	[0.013]	[0.012]	[0.012]	[0.088]	[0.056]	[0.057]
Constant	0.83	0.362	0.334	12.853	8.898	8.892	152.068	173.858	173.332
	[0.106]	[0.138]	[0.146]	[0.528]	[0.690]	[0.599]	[3.657]	[4.500]	[2.888]
Day of Week Dummies	NO	YES	YES	NO	YES	YES	NO	YES	YES
Month Dummies	NO	YES	YES	NO	YES	YES	NO	YES	YES
Year Dummies	NO	YES	YES	NO	YES	YES	NO	YES	YES
Holiday	NO	NO	YES	NO	NO	YES	NO	NO	YES
Avg Deaths last Day of Month	0.87	0.87	0.87	13.01	13.01	13.01	150.34	150.34	150.34
Observations	2324	2324	2324	2324	2324	2324	2324	2324	2324
R-squared	0.00	0.06	0.06	0.02	0.27	0.28	0.00	0.60	0.61

Notes: Robust standard errors in brackets. The dependent variable is the number of deaths per day within the hospital. The regressions include a second order polynomial in days from the first of the month fully interacted with a dummy for after the first of the month. The first column of each panel is the regression corresponding the to figure for that particular outcome. The second and third column in each panel include dummies for day of the week, month and year. The final column in each panel includes dummies for major holidays including 4th of July, Cinco de Mayo, Thanksgiving, Christmas and New Years.

Table 5: Regression Discontinuity Estimates of the Number of Deaths in California 1994-2000

	Internal			External		
RD on 1st of Month	6.412	6.267	2.889	2.706	2.742	1.906
	[8.907]	[6.220]	[5.431]	[1.290]	[1.126]	[1.083]
Days	0.864	0.896	1.557	0.310	0.306	0.309
	[2.214]	[1.561]	[1.466]	[0.333]	[0.299]	[0.292]
Days Sq	0.059	0.061	0.107	0.017	0.017	0.017
	[0.151]	[0.103]	[0.102]	[0.023]	[0.021]	[0.020]
Days*Post	-1.164	-1.178	-1.286	-0.766	-0.763	-0.575
	[2.827]	[1.895]	[1.794]	[0.411]	[0.365]	[0.358]
Days Sq*Post	-0.064	-0.068	-0.144	0.003	0.003	-0.008
	[0.191]	[0.125]	[0.124]	[0.028]	[0.025]	[0.025]
Week, Month and Year	NO	YES	YES	NO	YES	YES
Holiday	NO	NO	YES	NO	NO	YES
Avg Deaths last Day of Month	572.2	572.2	572.2	52.9	52.9	52.9
Observations	2352	2352	2352	2352	2352	2352
R-squared	0.00	0.61	0.61	0.02	0.23	0.25

By External Cause of Death

	Drugs and Alcohol			Motor Vehicle Accidents		
RD on 1st of Month	0.725	0.727	0.655	1.150	1.165	0.778
	[0.308]	[0.283]	[0.277]	[0.551]	[0.485]	[0.500]
Days	0.056	0.056	0.069	-0.202	-0.204	-0.172
	[0.078]	[0.072]	[0.075]	[0.149]	[0.131]	[0.135]
Days Sq	0.004	0.004	0.005	-0.010	-0.010	-0.008
	[0.005]	[0.005]	[0.005]	[0.010]	[0.009]	[0.009]
Days*Post	-0.128	-0.128	-0.135	0.132	0.133	0.178
	[0.099]	[0.091]	[0.092]	[0.182]	[0.162]	[0.165]
Days Sq*Post	-0.002	-0.002	-0.003	0.014	0.014	0.008
	[0.007]	[0.006]	[0.006]	[0.013]	[0.011]	[0.011]
Week, Month and Year	NO	YES	YES	NO	YES	YES
Holiday	NO	NO	YES	NO	NO	YES
Avg Deaths last Day of Month	4.4	4.4	4.4	10.3	10.3	10.3
Observations	2352	2352	2352	2352	2352	2352
R-squared	0.02	0.15	0.15	0.00	0.21	0.23

	Homicide			Suicide		
RD on 1st of Month	-0.201	-0.182	-0.393	0.553	0.551	0.550
	[0.530]	[0.434]	[0.401]	[0.409]	[0.388]	[0.412]
Days	0.093	0.089	0.066	-0.035	-0.034	-0.054
	[0.140]	[0.115]	[0.108]	[0.117]	[0.111]	[0.111]
Days Sq	0.003	0.003	0.001	-0.001	-0.001	-0.002
	[0.010]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]
Days*Post	-0.290	-0.288	-0.202	0.115	0.114	0.139
	[0.170]	[0.139]	[0.132]	[0.140]	[0.134]	[0.136]
Days Sq*Post	0.010	0.011	0.009	-0.007	-0.007	-0.006
	[0.012]	[0.009]	[0.009]	[0.010]	[0.009]	[0.009]
Week, Month and Year	NO	YES	YES	NO	YES	YES
Holiday	NO	NO	YES	NO	NO	YES
Avg Deaths last Day of Month	8.5	8.5	8.5	8.7	8.7	8.7
Observations	2352	2352	2352	2352	2352	2352
R-squared	0.00	0.35	0.36	0.01	0.10	0.10

Notes: See notes from Table 4. These regressions include all deaths in California both inside and outside the hospital. External deaths include those due to drugs and alcohol. To conserve space the constant, though it is included in the regressions, is not included in the tables.

Table 6: Regression Discontinuity Estimates of the Overall Increase in Arrests and in Arrests for Drug Crimes in California 1993-1999

	All Crimes			Other Drug			Narcotics		
RD on 1st of Month	341.097	347.331	364.310	24.809	24.170	29.795	31.947	30.425	37.260
	[72.741]	[38.997]	[36.491]	[4.515]	[3.444]	[3.218]	[6.239]	[4.000]	[3.362]
Days	31.175	30.879	0.908	1.142	1.198	-0.520	1.984	2.087	0.363
	[20.410]	[11.294]	[9.835]	[1.262]	[0.932]	[0.867]	[1.560]	[1.006]	[0.906]
Days Sq	3.140	3.108	0.954	0.143	0.144	0.019	0.194	0.194	0.069
	[1.412]	[0.782]	[0.684]	[0.087]	[0.064]	[0.060]	[0.109]	[0.068]	[0.063]
Days*Post	-91.357	-93.812	-58.812	-2.841	-2.846	-1.849	-4.964	-4.858	-4.186
	[24.432]	[13.389]	[12.042]	[1.524]	[1.139]	[1.062]	[2.023]	[1.265]	[1.109]
Days Sq*Post	-0.103	0.156	2.107	-0.112	-0.114	0.049	-0.105	-0.115	0.067
	[1.683]	[0.917]	[0.834]	[0.105]	[0.077]	[0.074]	[0.139]	[0.084]	[0.077]
Week, Month & Year	NO	YES	YES	NO	YES	YES	NO	YES	YES
Holiday	NO	NO	YES	NO	NO	YES	NO	NO	YES
Avg Arrests last Day of Month	5110.3	5110.3	5110.3	204.3	204.3	204.3	163.1	163.1	163.1
Observations	2352	2352	2352	2352	2352	2352	2352	2352	2352
R-squared	0.03	0.71	0.77	0.05	0.52	0.57	0.05	0.69	0.73

	Dangerous Drugs			Cannabis		
RD on 1st of Month	25.710	25.147	29.368	12.639	11.717	16.269
	[4.997]	[3.654]	[3.576]	[5.285]	[3.118]	[2.949]
Days	1.342	1.375	0.008	1.089	1.149	-0.457
	[1.318]	[0.975]	[0.964]	[1.414]	[0.842]	[0.795]
Days Sq	0.140	0.139	0.039	0.138	0.138	0.021
	[0.092]	[0.068]	[0.067]	[0.099]	[0.058]	[0.055]
Days*Post	-2.170	-2.157	-1.382	-0.649	-0.599	0.379
	[1.659]	[1.219]	[1.180]	[1.772]	[1.045]	[0.973]
Days Sq*Post	-0.205	-0.205	-0.072	-0.209	-0.213	-0.059
	[0.114]	[0.084]	[0.082]	[0.123]	[0.072]	[0.067]
Week, Month & Year	NO	YES	YES	NO	YES	YES
Holiday	NO	NO	YES	NO	NO	YES
Avg Arrests last Day of Month	152.3	152.3	152.3	137.3	137.3	137.3
Observations	2352	2352	2352	2352	2352	2352
R-squared	0.06	0.53	0.56	0.02	0.69	0.72

Notes: Robust standard errors in brackets. The dependent variable is the number of arrests per day. The Narcotics category includes arrests for heroin and cocaine possession. The Dangerous Drugs category includes arrests for methamphetamine possession. The Cannabis category includes arrests for cannabis possession and sale. The Other Drugs category includes manufacture, sale and transport of drugs.The regressions include a second order polynomial in days from the first of the month fully interacted with a dummy for after the first of the month. The first column of each panel is the regression corresponding the to figure for that particular outcome. The second and third column in each panel include dummies for day of the week, month and year. The final column in each panel includes dummies for the major holidays. The drug crime categories listed above are based on the summaries of the California Health and Safety Codes provided with the MACR data. To conserve space the constant, though it is included in the regressions, is not included in the tables.

Table 7: Regression Discontinuity Estimates of the Increase in Arrests for Revenue Generating Crimes in California 1993-1999

	Theft			Burglary			MV Theft		
RD on 1st of Month	6.230	4.981	21.070	-8.522	-9.243	-5.258	-2.317	-2.477	-1.299
	[10.555]	[6.408]	[5.155]	[4.686]	[2.774]	[2.521]	[3.304]	[1.766]	[1.736]
Days	-5.341	-5.226	-10.609	-1.681	-1.631	-3.106	0.976	0.983	0.457
	[3.122]	[1.951]	[1.389]	[1.325]	[0.802]	[0.679]	[0.886]	[0.473]	[0.468]
Days Sq	-0.200	-0.197	-0.587	-0.091	-0.090	-0.197	0.066	0.065	0.027
	[0.217]	[0.135]	[0.097]	[0.091]	[0.055]	[0.047]	[0.062]	[0.033]	[0.033]
Days*Post	5.397	5.424	8.891	2.285	2.363	3.446	-1.058	-1.040	-0.590
	[3.633]	[2.277]	[1.701]	[1.550]	[0.936]	[0.832]	[1.086]	[0.581]	[0.573]
Days Sq*Post	0.318	0.309	0.801	0.121	0.112	0.239	-0.068	-0.069	-0.028
	[0.252]	[0.154]	[0.118]	[0.106]	[0.064]	[0.058]	[0.075]	[0.040]	[0.040]
Week, Month & Year	NO	YES	YES	NO	YES	YES	NO	YES	YES
Holiday	NO	NO	YES	NO	NO	YES	NO	NO	YES
Avg Arrests last Day of Month	424.8	424.8	424.8	164.9	164.9	164.9	86.4	86.4	86.4
Observations	2352	2352	2352	2352	2352	2352	2352	2352	2352
R-squared	0.01	0.68	0.78	0.02	0.66	0.70	0.00	0.73	0.74

	Robbery			Forgery			Prostitution		
RD on 1st of Month	-1.034	-1.300	0.000	-1.903	-2.373	-0.549	-8.923	-9.561	-6.732
	[2.504]	[1.866]	[1.593]	[1.744]	[1.197]	[1.088]	[3.723]	[2.506]	[2.419]
Days	0.167	0.183	-0.379	0.093	0.137	-0.369	-0.139	-0.107	-0.956
	[0.681]	[0.505]	[0.429]	[0.475]	[0.329]	[0.293]	[1.083]	[0.735]	[0.652]
Days Sq	-0.003	-0.003	-0.044	0.013	0.015	-0.022	0.022	0.020	-0.042
	[0.046]	[0.034]	[0.030]	[0.033]	[0.023]	[0.020]	[0.076]	[0.051]	[0.045]
Days*Post	-1.316	-1.289	-0.832	-0.092	-0.062	0.189	1.542	1.568	2.062
	[0.803]	[0.591]	[0.526]	[0.568]	[0.397]	[0.359]	[1.265]	[0.850]	[0.798]
Days Sq*Post	0.087	0.085	0.131	-0.006	-0.013	0.038	-0.064	-0.064	0.016
	[0.055]	[0.040]	[0.036]	[0.039]	[0.027]	[0.025]	[0.089]	[0.059]	[0.055]
Week, Month & Year	NO	YES	YES	NO	YES	YES	NO	YES	YES
Holiday	NO	NO	YES	NO	NO	YES	NO	NO	YES
Avg Arrests last Day of Month	70.1	70.1	70.1	40.8	40.8	40.8	40.8	40.8	40.8
Observations	2352	2352	2352	2352	2352	2352	2352	2352	2352
R-squared	0.01	0.48	0.50	0.00	0.55	0.60	0.01	0.59	0.62

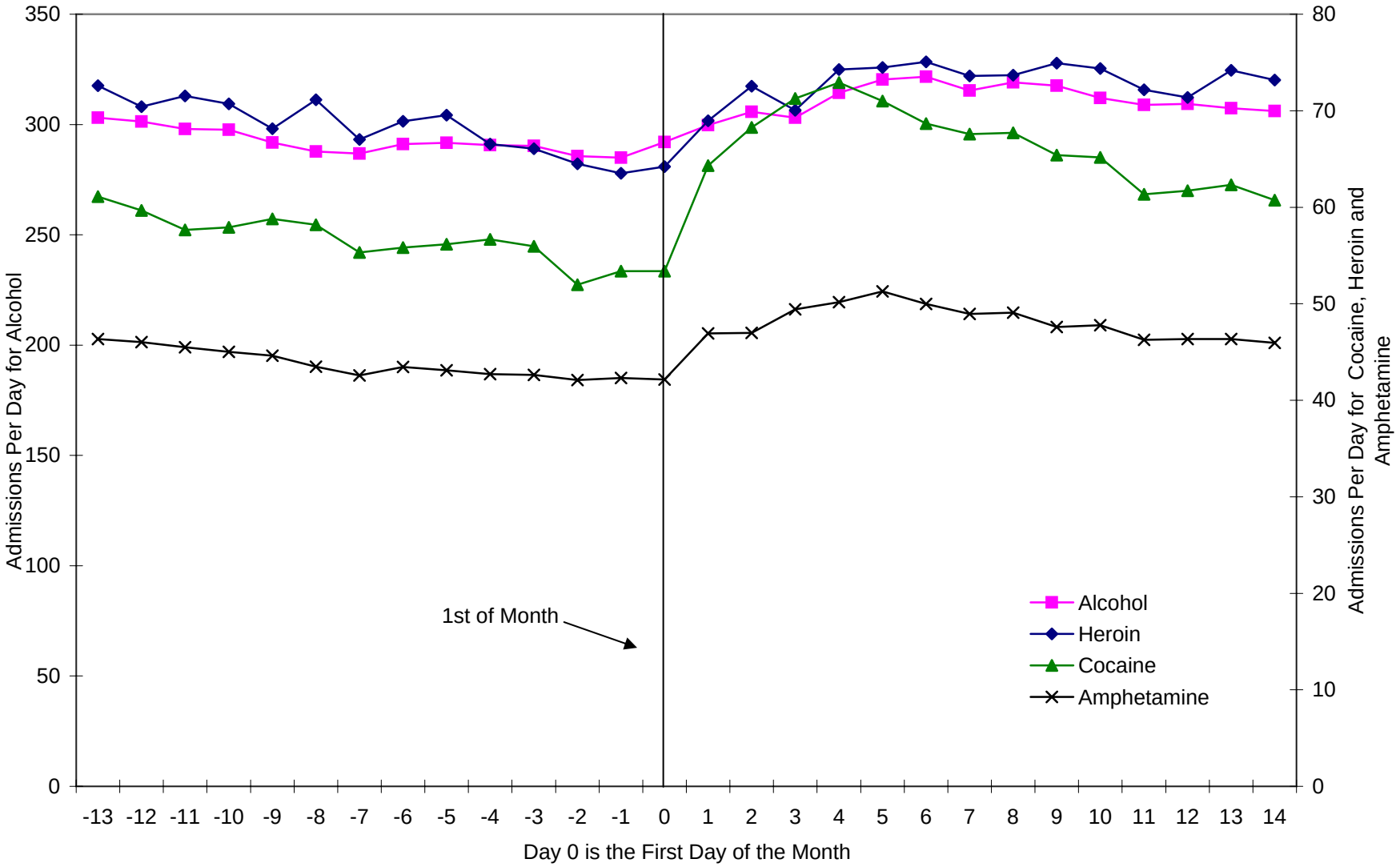
Notes: Robust standard errors in brackets. The dependent variable is the number of arrests per day. The regressions include a second order polynomial in days from the first of the month fully interacted with a dummy for after the first of the month. The first column of each panel is the regression corresponding the to figure for that particular outcome. The second and third column in each panel include dummies for day of the week, month and year. The final column in each panel includes dummies for the major holidays. The drug crime categories listed above are based on the summaries of the California Health and Safety Codes provided with the MACR data. To conserve space the constant, though it is included in the regressions, is not included in the tables.

Table 8: Patients with Repeated Drug-Related Admissions from 1994-2000 by Cash Aid Category

Number of Admissions	SSI				Welfare				Medicare (proxy for DI)				Other			
	Patients	Admissions	Pct of Total Admits	Avg. Charges per Patient	Patients	Admissions	Pct of Total Admits	Avg. Charges per Patient	Patients	Admissions	Pct of Total Admits	Avg. Charges per Patient	Patients	Admissions	Pct of Total Admits	Avg. Charges per Patient
1	25,451	25,451	24%	$18,919	23,015	23,015	69%	$9,901	16,294	16,294	25%	$18,760	120,617	120,617	55%	$14,359
2-3	12,164	28,237	27%	$37,602	3,938	8,582	26%	$22,410	7,009	16,240	25%	$38,119	27,360	61,460	28%	$27,302
4-5	3,459	15,183	15%	$68,090	300	1,293	4%	$49,921	2,052	9,009	14%	$66,172	4,458	19,360	9%	$48,220
6-10	2,586	19,053	18%	$107,292	76	513	2%	$66,144	1,671	12,380	19%	$103,391	1,947	14,002	6%	$78,676
11-20	850	11,740	11%	$180,154	5	61	0%	$154,145	550	7,644	12%	$175,777	333	4,489	2%	$133,757
20+	154	4,472	4%	$332,804	0	0	0%	--	131	3,760	6%	$327,582	43	1,238	1%	$278,173
Total	44,664	104,136	100%		27,334	33,464	100%		27,707	65,327	100%		154,758	221,166	100%	

Notes: This table includes the frequency of drug-related hospital admissions by each patient and the number of total admissions that such patients comprise. For example, among SSI recipients who were admitted with a drug-related mention, 3,459 of those individuals were admitted 4 or 5 times over our sample period and these patients account for 15,183 admissions, or 15% of all drug-related admissions by SSI recipients. Individuals who change program status during the sample are only counted during the time they are on a particular cash aid program. Patients are identified with coded record locator numbers (RLNs) and these numbers are used to track patients who are admitted more than once over our sample. Some patients are not given RLNs (approximately 5% of the drug-related admissions) so these patients are not included in this table, but are included in the other analysis. As a result, the total admissions in this table may not match total admissions in other tables; this table includes only admissions with valid RLNs. Hospital list charges have the limitations that many insurers have negotiated discounts, charges may cover other conditions treated during the hospital stay, and charges do not cover ambulance rides.

Figure 1: Average Daily Drug and Alcohol Related Hospital Admissions (California 1994-2000)



Notes: Figures that are regression adjusted for day of week, month, year and major holidays look very similar to the figures above. The figures include people admitted between 1/1/1994 and 11/30/2000. -1 is the last day of the preceding month.

Figure 2: Average Daily Hospital Admissions With Mention of Cocaine, Heroin or Amphetamine
By Cash Aide Program (California 1994-2000)

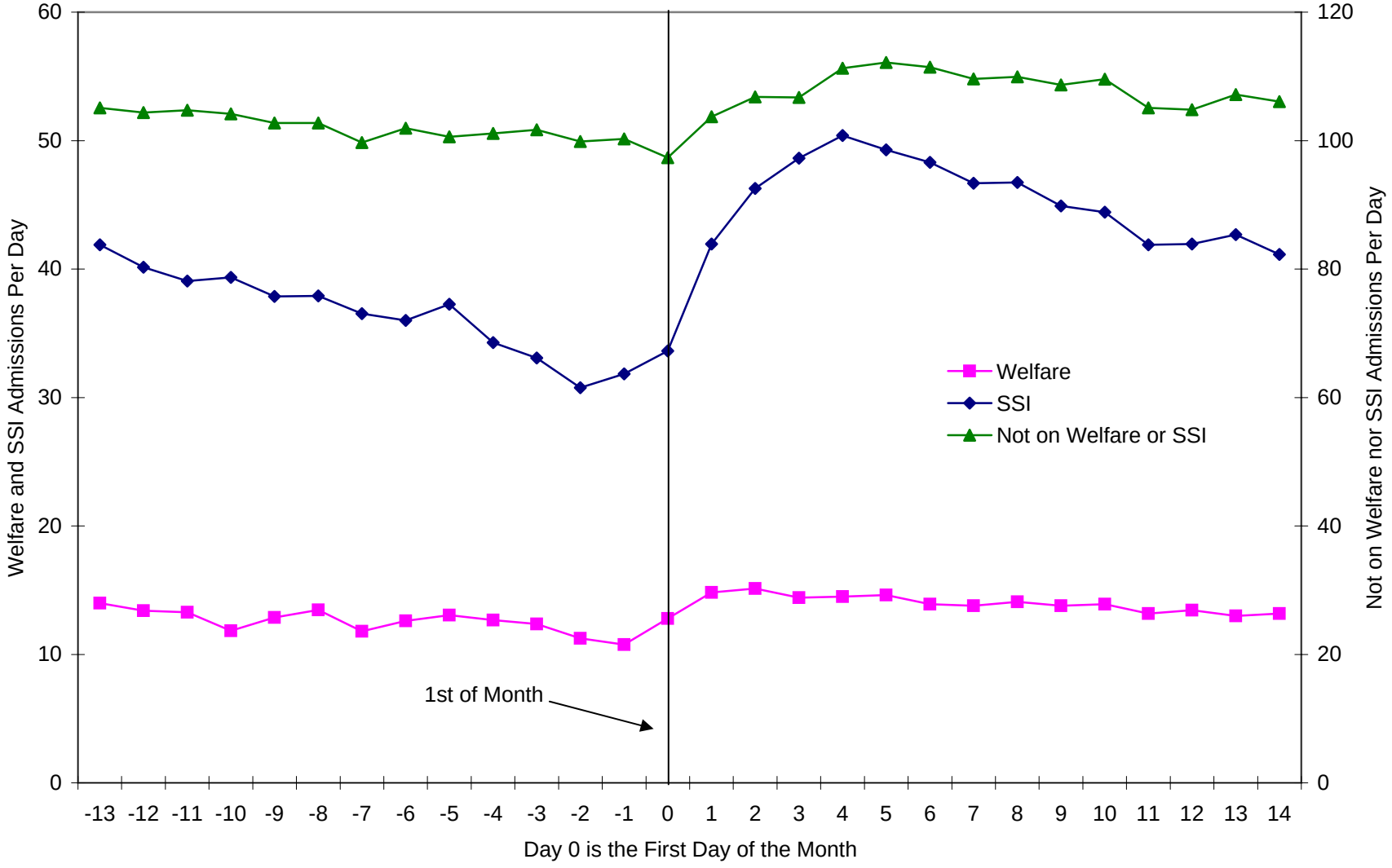
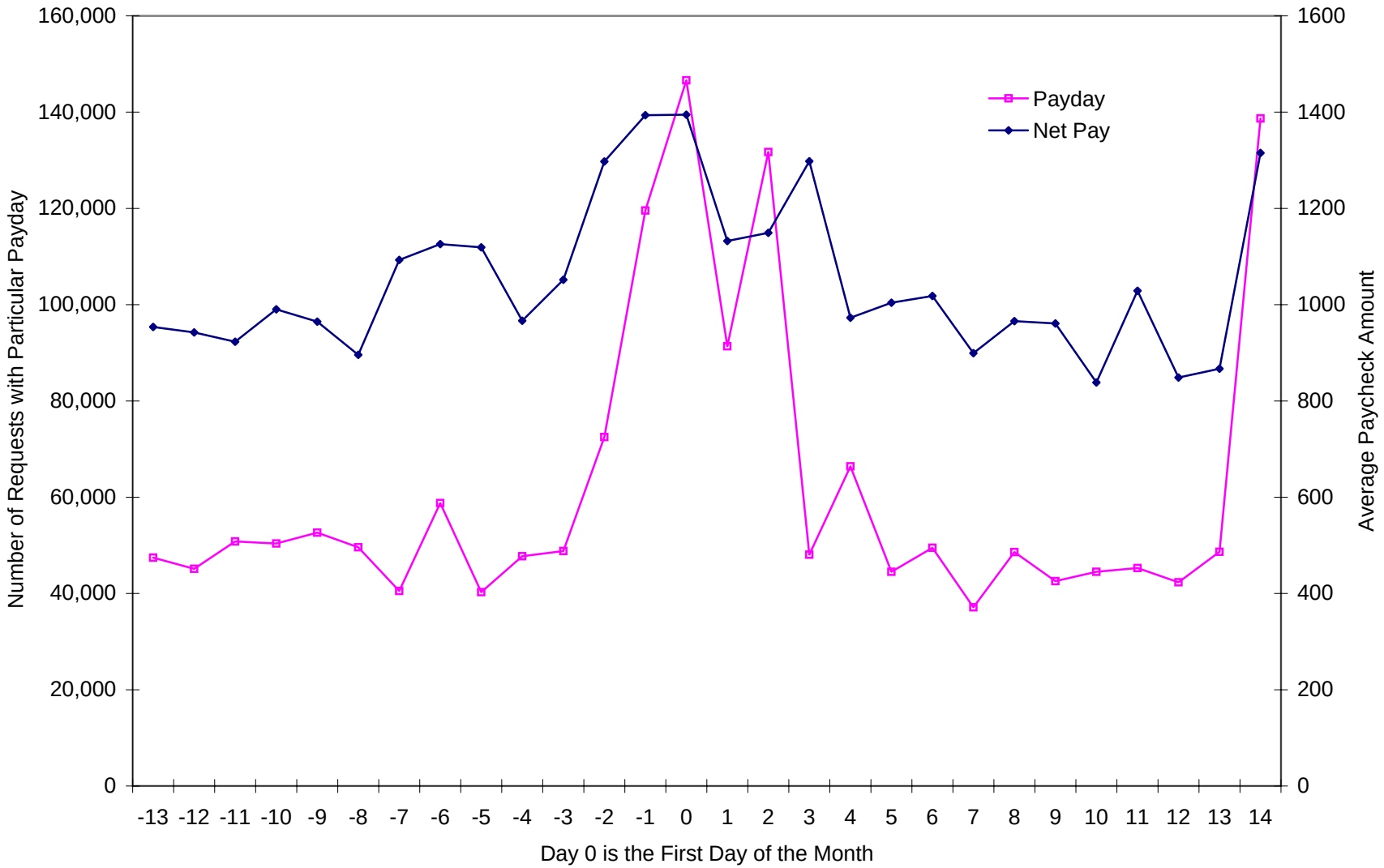
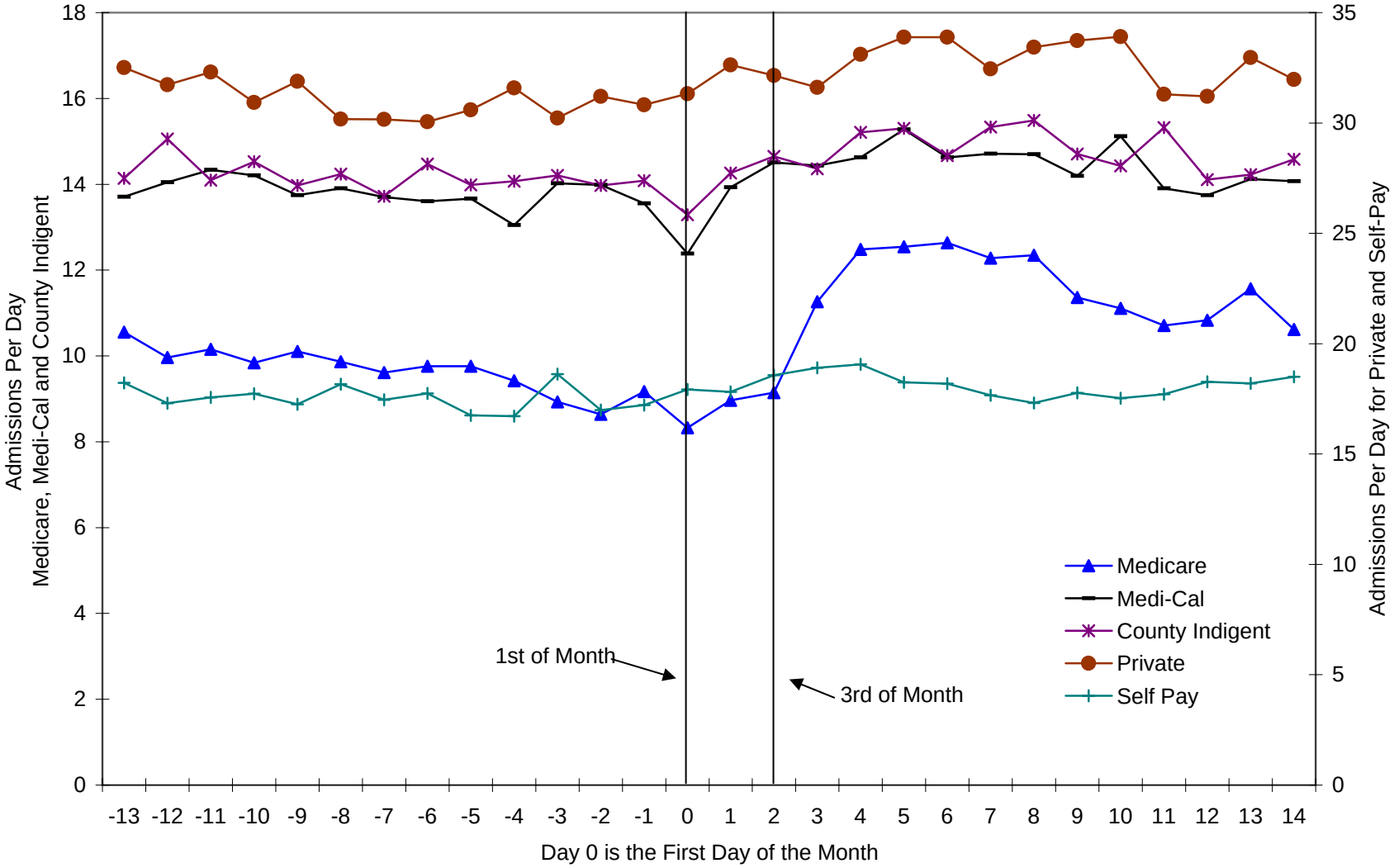


Figure 3: Overall Cycles in Pay Dates and Pay Check Size



The sample above is comprised of individuals seeking payday loans in 16 states (1998-2004). The frequencies were calculated from a proprietary dataset for use in Skiba and Tobacman (2005). We are grateful to Paige Skiba for providing the frequencies.

Figure 4: Daily Average Hospital Admissions With Mention of Cocaine, Heroin or Amphetamine
By Insurance Type for Those NOT Receiving Welfare or SSI (California 1994-2000)



Note: This figure excludes patients receiving either SSI or Welfare.

Figure 5: Daily Average Hospital Admissions With Mention of Alcohol
By Cash Aide Program (California 1994-2000)

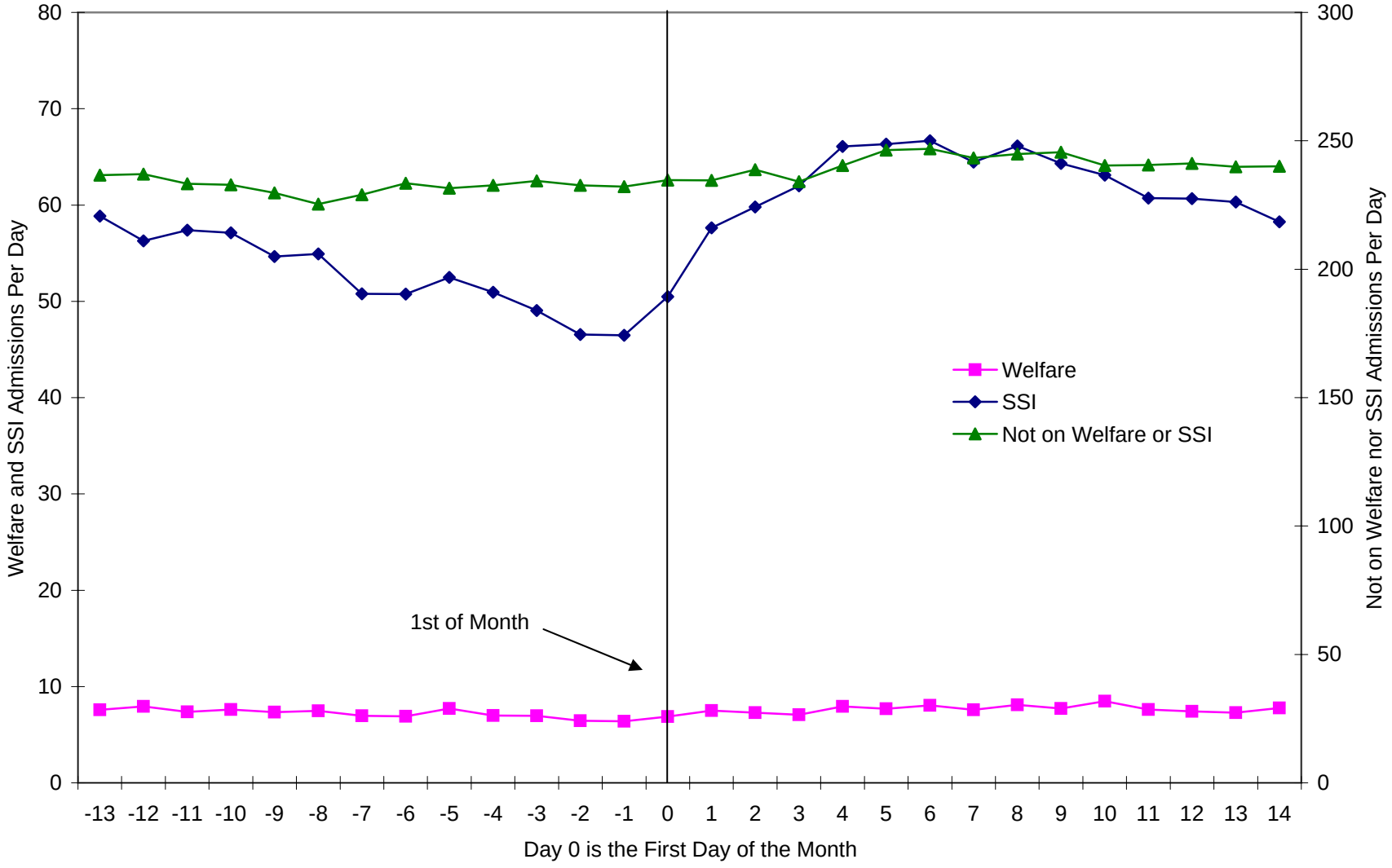


Figure 6: Proportion of Patients With Cocaine, Heroin or Amphetamine Admission Leaving the Hospital For Home (California 1994-2000)

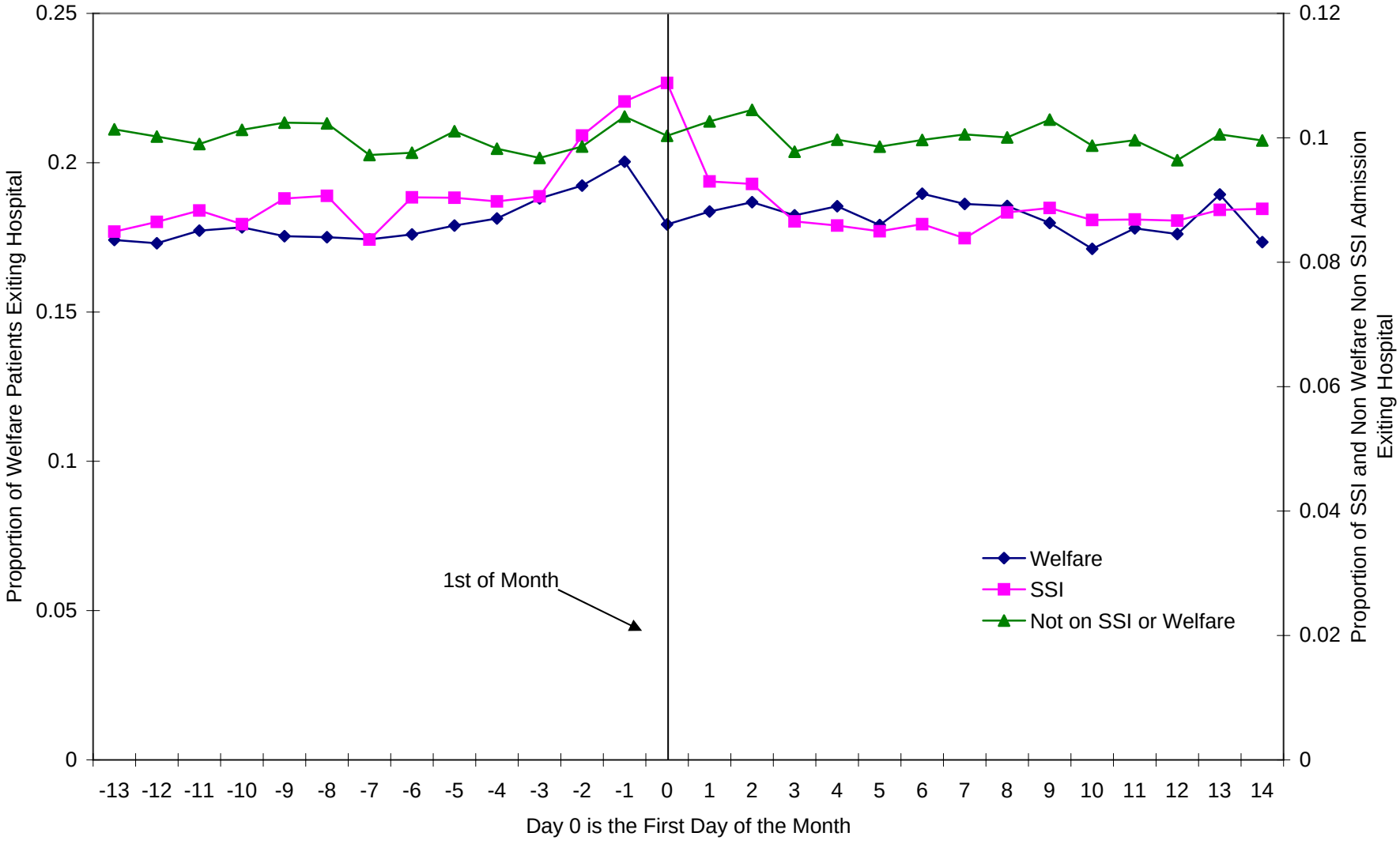


Figure 7: Proportion of Patients With Cocaine, Heroin or Amphetamine Admission Leaving the Hospital Against Medical Advice

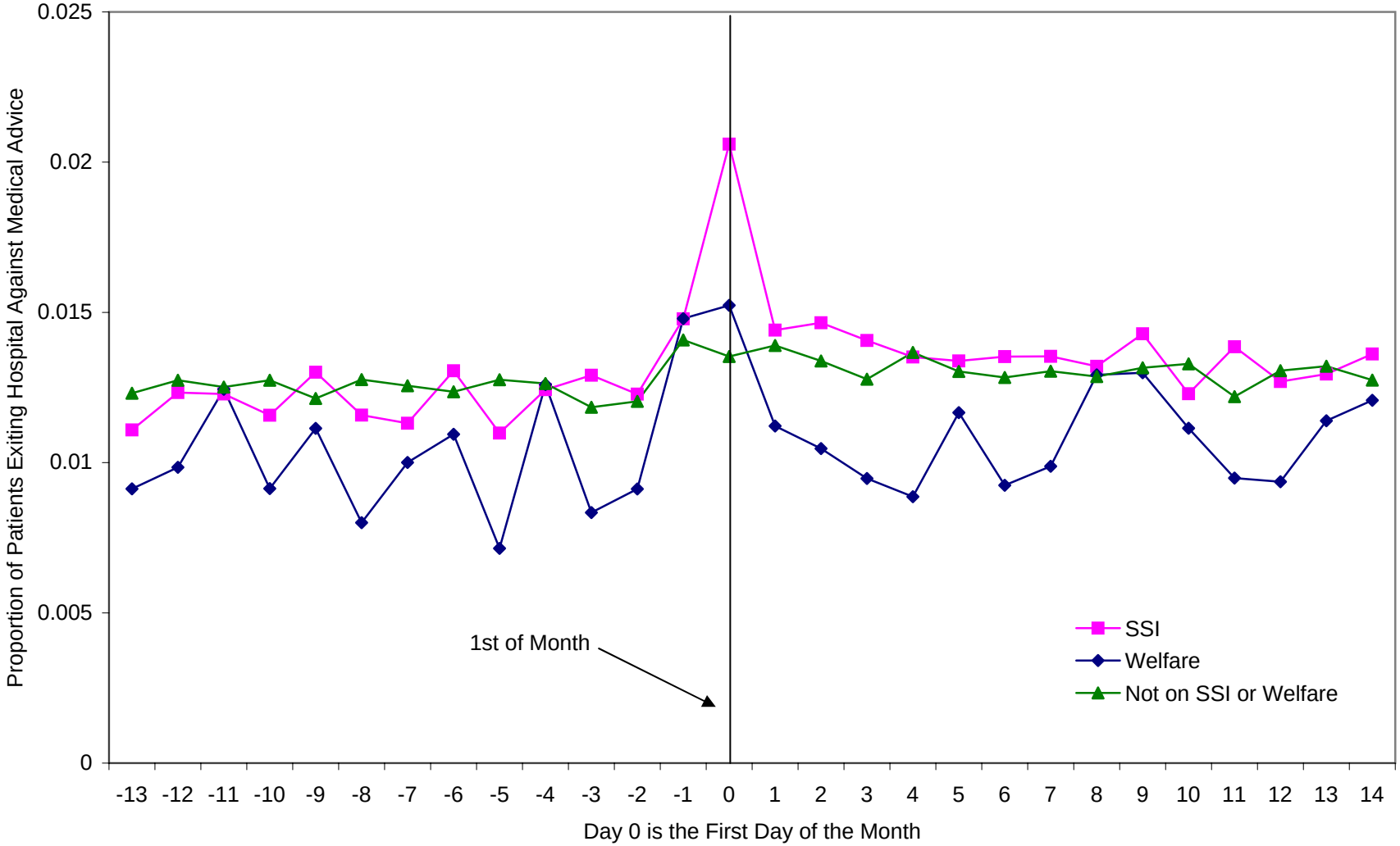
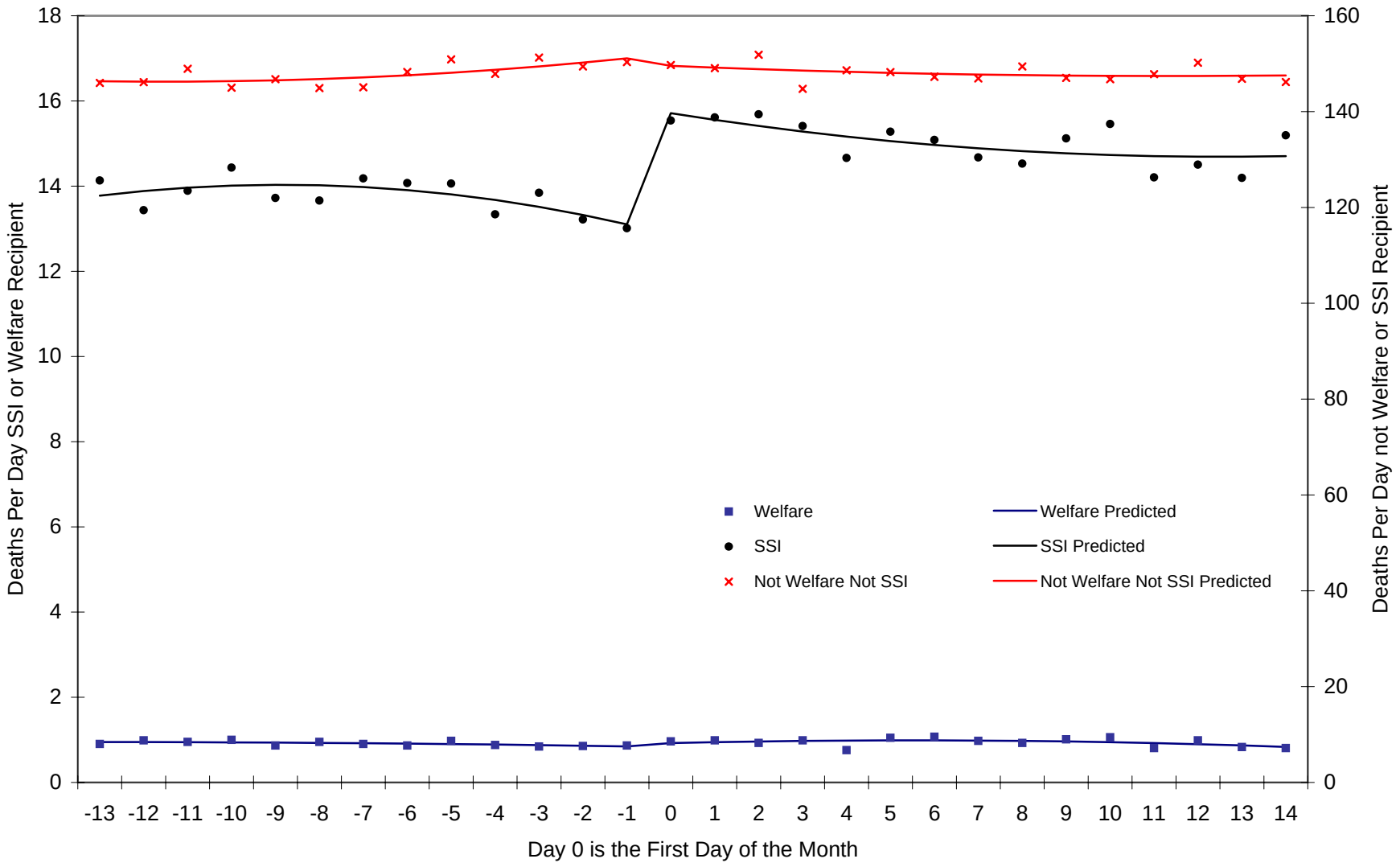
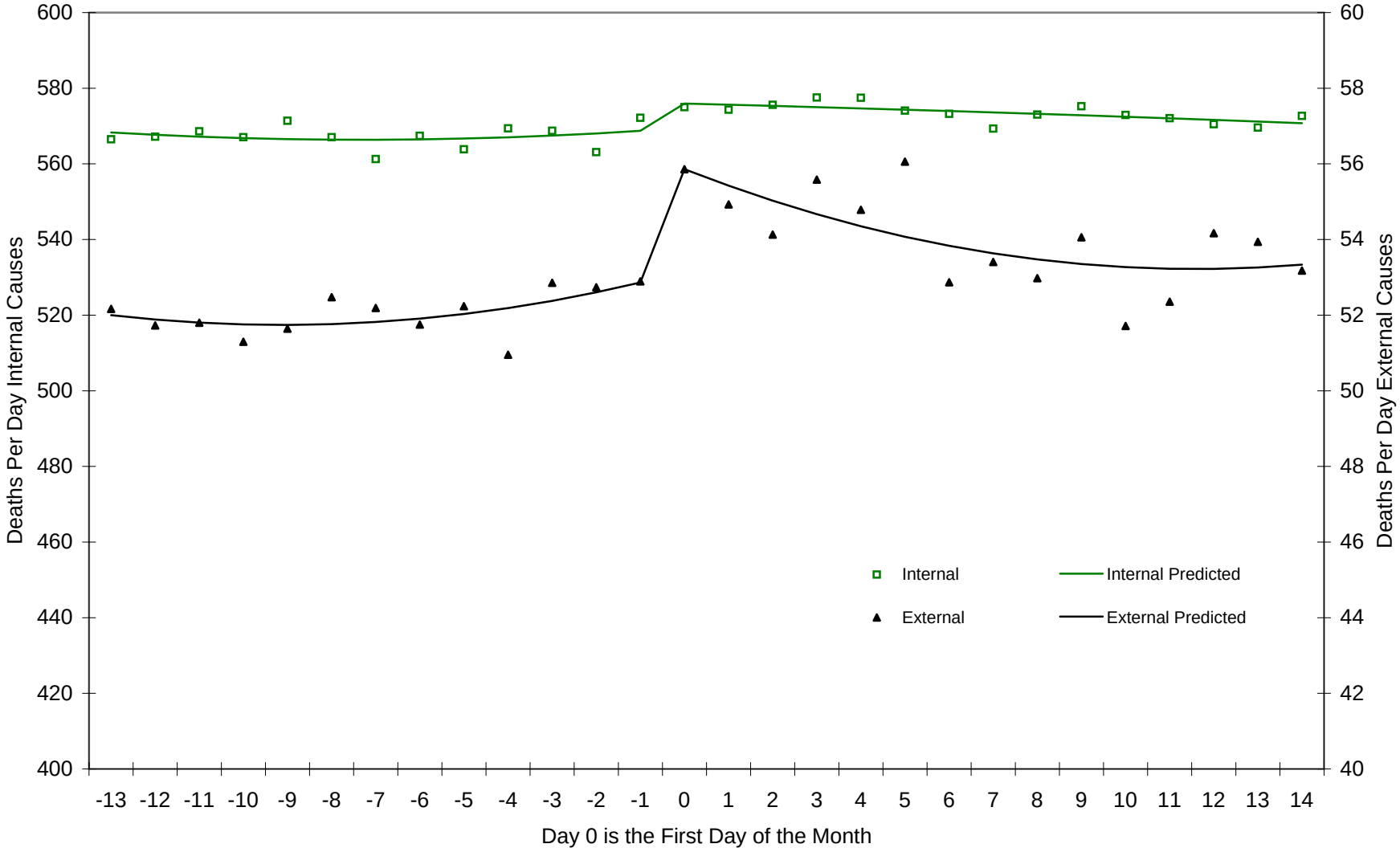


Figure 8: Deaths Within the Hospital in California by Coverage Type



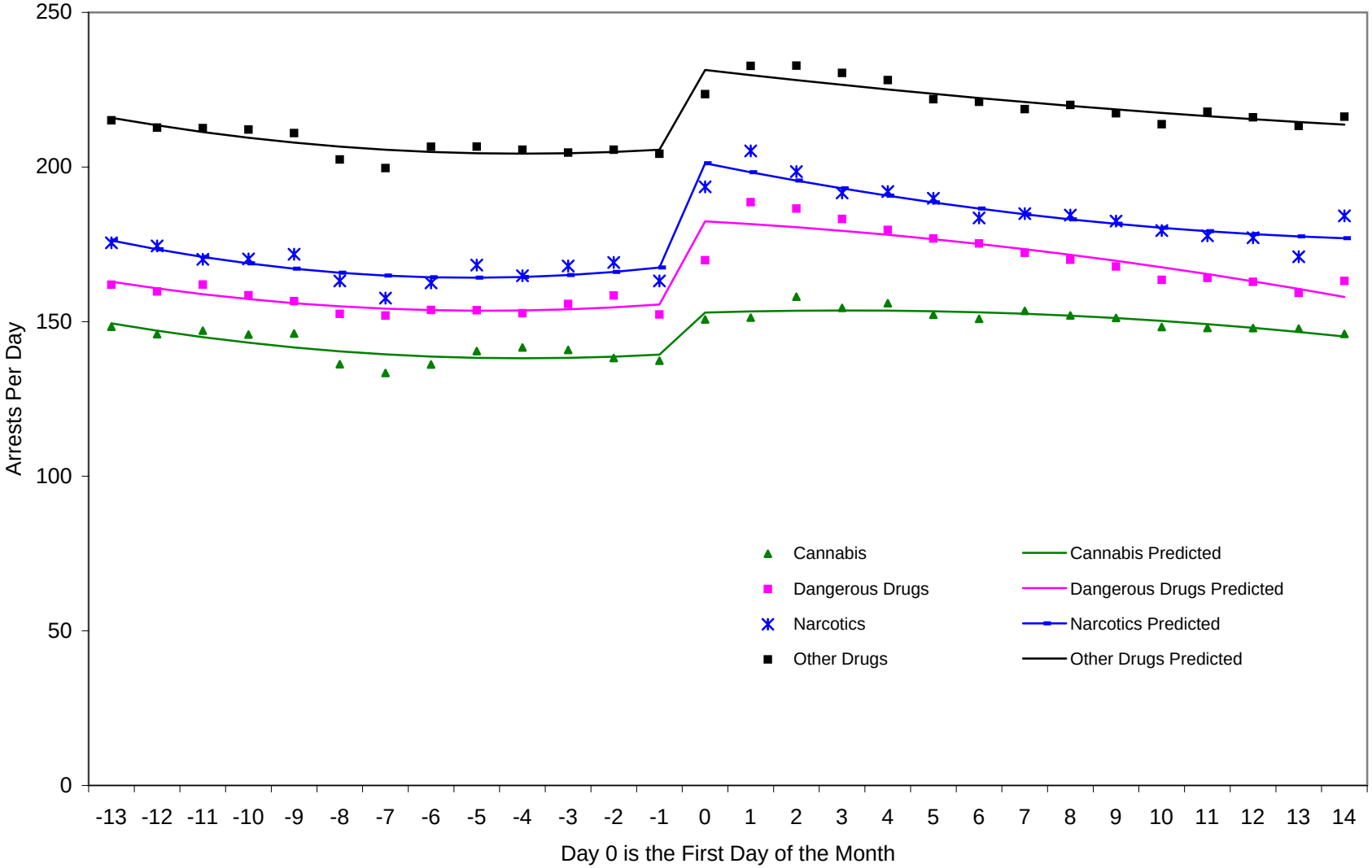
Note: The counts are based on day of admission rather than day of death. The line laid over the daily means is a quadratic polynomial in days fully interacted with a dummy for after the first of the month.

Figure 9: Internal and External Causes of Death for all Deaths in California 1994-2000



Notes: These counts are for all deaths occurring in California between 1994 and 2000 not just deaths within the hospital. External deaths include deaths due to drugs and alcohol.

Figure 10: Monthly Cycle in Arrests for Drug Possession or Sale (California 1993-1999)



Notes: The Narcotics category includes arrests for heroin and cocaine possession. The Dangerous Drugs category includes arrests for methamphetamine possession. The Other Drugs category includes manufacture, sale and transport of drugs.

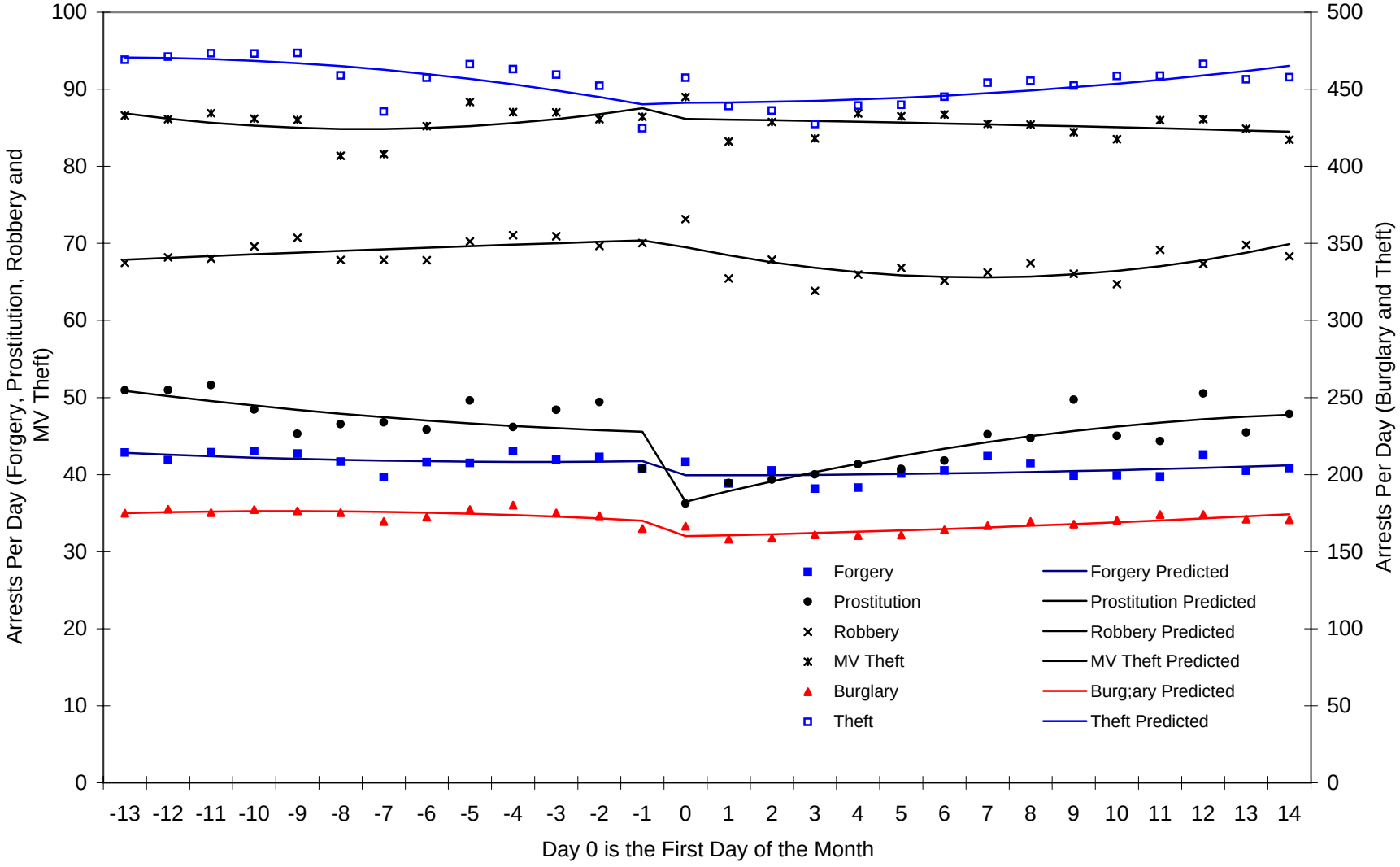



Figure 11: Monthly Cycle in Revenue Generating Crimes (California 1993-1999)