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Does managed care produce lower health care utilization and costs through better aligned financial incentives and alternative delivery methods (the "pure" HMO effect) or by attracting more healthy enrollees (enrollee selection)? The purpose of this paper is to shed new light on this fundamental question using a quasi-experimental approach that exploits the timing and county specific implementation of Medicaid managed care plans in two distinct sub-sets of Kentucky counties in the late 1990s. We find large differences in the relative success of each region in reducing utilization that are likely driven by important differences in plan design. Asthmatic children enrolled in the plan that was successful at reducing utilization did not appear to suffer adverse health outcomes as a result.

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## I. Introduction

Managed care health insurance plans, such as Health Maintenance Organizations (HMOs), are generally thought of as a lower cost alternative to traditional Fee-For-Service (FFS) plans. In theory, managed care plans are able to reduce utilization and costs through a variety of mechanisms. One such mechanism is the capitation of fees paid to providers. Managed care plans often pay providers a lump sum per patient that does not vary based on the services provided to the patient. Thus, unlike with a FFS plan, under managed care the marginal revenue a physician receives from the provision of an additional service is zero. Capitated fees therefore create incentives for physicians to reduce utilization. Other features of managed care plans that may result in reduced utilization and costs include restricting enrollees to a specific list of covered providers, the use of primary care "gate-keeper" physicians that must provide prior authorization for specialist visits, careful monitoring of physician resource utilization, and the promotion of preventative care. These features are supposed to help ensure enrollees are receiving the appropriate level of care in the appropriate setting.[1]

How popular are managed care plans? According to Glied (2000), over 70 percent of all Americans with health insurance were enrolled in some form of managed care by 1993. Policymakers have taken a particular interest in the possibility that managed care can lead to reductions in utilization and costs. The Balanced Budget Act (BBA) of 1997 permitted new forms of managed care plans to participate in Medicare and also gave states the broad authority to mandate enrollment in Medicaid managed care plans without obtaining a federal waiver.[2] According to the Kaiser Family Foundation (2001), over half of all Medicaid beneficiaries were

[1] Various aspects of literature on managed care are reviewed in Glied (2000), Luft (1981), and Cutler and Zeckhauser (2000).

[2] For more discussion of Medicare managed care, see Kaiser Family Foundation (2007) Fact Sheet "Medicare Advantage" and for more discussion of Medicaid managed care, See Kaiser Family Foundation (2001) Fact Sheet "Medicaid and Managed Care".

enrolled in a managed care plan in 2000. Despite the growth in the popularity of managed care plans, there remains very little convincing evidence on the impact of such plans on the utilization of health care services, health care costs, and health outcomes.

Many researchers have pointed out that simply comparing the utilization of managed care enrollees with the utilization of FFS enrollees may not be informative due to the ability of enrollees in many circumstances to choose their health plan. The observation that managed care plans have lower costs than FFS plans could be explained by managed care plans disproportionately enrolling lower utilization / lower cost customers. Therefore a question that has persistently plagued both researchers and policymakers alike is whether HMOs and other forms of managed care produce lower health care utilization through better aligned financial incentives and alternative delivery methods (the pure HMO effect) or by attracting more healthy enrollees (enrollee selection).

The purpose of our paper is to shed new light on this question of the "pure" HMO effect versus "enrollee selection" using a quasi-experimental approach that exploits the timing and county specific implementation of Medicaid managed care mandates in Kentucky in the late 1990s. The Medicaid program in Kentucky was changed from a FFS system to a managed care system in two geographically distinct sub-sets of counties, so we can compare recipients initially in each of the two sets of "treatment" counties before and after this reform with recipients initially in neighboring "control" counties that remained in a FFS system in order to assess the impact of Medicaid managed care on child health care utilization (i.e., changes along the intensive margin).

Having two distinct treatment regions built around the two largest cities in the state (Louisville and Lexington) is one unique aspect of this reform. Differences in the managed care

plans established in each region motivate our heterogeneous treatment effect approach of modeling the impact of each plan separately. The Louisville-centered plan (Passport) elected to reimburse physicians using a capitated payment scheme, while the Lexington-centered plan (Kentucky Health Select or KHS) opted for a modified FFS reimbursement scheme for physicians. Another important difference is that the Louisville-centered plan contracted out administrative responsibilities such as utilization review to an experienced managed care organization while the Lexington-centered plan decided to handle such responsibilities internally. The Louisville-centered plan continues to serve Medicaid patients today, while the Lexington-centered plan ceased operations after two and a half years.

A few recently published papers (Duggan (2004) and Aizer, Currie, and Moretti (2007)) have attempted to address similar issues using Medicaid managed care mandates in California that occurred at roughly the same time.[3] The unique implementation of Medicaid managed care in Kentucky and our empirical strategy allow us to make several new and important contributions to the literature. Unlike California, Kentucky required that Medicaid managed care plans provide encounter data for enrollees in a similar format to what was previously reported under the FFS regime. Therefore, a major contribution of our paper is that we observe any changes in utilization among Medicaid recipients moving into managed care. Another novel feature of our paper is that we focus on children enrolled for 30 consecutive months of Medicaid coverage in order to isolate the managed care effect on the utilization of a group for which we have some priors about potential changes in utilization patterns.[4] Our focus on the continually enrolled helps to eliminate confounding factors, such as the effect of lagged insurance coverage,

[3] A related paper, Currie and Fahr (2005), uses nationally representative data from the National Health Interview Survey to evaluate the impact of Medicaid managed care growth on the probability that individual children were Medicaid-covered and their utilization of care.

[4] In general, children are much less likely to be hospitalized than adults, so we anticipate that a managed care program would focus on reducing the number of office visits or outpatient services consumed by children.

on current utilization. A third key feature is that we deal with migration endogeneity by instrumenting actual managed care enrollment with managed care eligibility based on initial county of residence, which we observe nearly one full year before the implementation of managed care. Fourth, we show that our comparison of border sharing counties in Kentucky makes for a very homogenous set of treatment and control groups. By looking at geographic areas that are contiguous and relatively homogenous – yet treated very differently by the implementation of managed care – we feel more confident that the effects we measure do not represent other omitted county-level factors. Fifth, we use data from the March Current Population Survey (CPS) to investigate whether or not the reform had an impact on Medicaid enrollment decisions of children (i.e., changes along the extensive margin). Finally, we examine whether reductions in health care utilization had detrimental impact on the health of a vulnerable population, children with asthma.

Along the intensive margin, we find that both managed care plans decreased outpatient utilization among the children in our sample, though the Louisville-centered plan was able to do so to a greater degree (a 66 percent reduction versus a 21 percent reduction). In addition, both programs appear to have had a minimal impact on inpatient utilization for children, which may be explained by low baseline inpatient utilization rates. Another important difference between the two programs is that the Louisville-centered plan reduced professional (physician) utilization by 47 percent among children, while in the Lexington-centered plan professional (physician) utilization actually increased by 3 percent. Therefore, the heterogeneous treatments generated by differences in plan design between the two regions led to different outcomes with respect to utilization. These results, based on roughly a year and a half of post-reform data, foreshadow the eventual failure of the Lexington-based plan. Along the extensive margin, we see some evidence

of movement of children out of Medicaid coverage and into no coverage. Finally, we find suggestive evidence that the reductions in utilization observed in the Louisville-centered plan did not lead to adverse health outcomes for asthmatic children, as measured by inpatient hospitalizations.

The rest of the paper proceeds as follows: section II provides a description of the policy change in Kentucky Medicaid. Section III reviews the literature on the impact of managed care on utilization and describes how our approach contributes to this literature. Our methodological approach and identification strategy is described in section IV and our data in section V. Section VI presents our results, section VII describes the results of some specification checks, and section VIII concludes with a discussion of policy implications.

## II. The Introduction of Managed Care in Kentucky Medicaid

### *Brief History*

In October 1995, the Commonwealth of Kentucky received Centers for Medicare and Medicaid (CMS) approval to initiate a major restructuring of the Kentucky Medicaid program by dividing the state into eight regional managed care networks. Within each region public and private providers were expected to collaborate to form managed care partnerships to oversee the provision of Medicaid services, rather than contracting these services out to commercial managed care providers. The goals of this restructuring were to improve access and quality of care within Kentucky Medicaid, stabilize cost growth, and emphasize primary care and prevention.

In November 1997, Medicaid managed care enrollment began in the two regions that contain the state's two major urban areas, region 3 (anchored by Louisville) and region 5

(anchored by Lexington). These, along with the other regions, are labeled in Figure 1. The managed care plan covering region 3 was named the Passport Health Plan (Passport) and the managed care plan covering region 5 was named the Kentucky Health Select Plan (KHS). Ultimately, the other six regions were not able to successfully create managed care partnerships. Passport, designed around the University of Louisville network, was charged with providing Medicaid managed care coverage to all Medicaid recipients in Jefferson County (containing Louisville) and 15 surrounding counties. Similarly, the KHS plan was designed around the University of Kentucky network and was charged with providing Medicaid managed care to all Medicaid recipients in Fayette County (containing Lexington) and 20 surrounding counties.[5] As mentioned above, one motivating factor behind these partnerships was to prevent the state from exercising its option to open up for bidding the exclusive rights to these managed care contracts to commercial insurers.[6]

Both plans also agreed to continue reporting encounter data to the state as they had under Medicaid FFS reimbursement rules. Because the plans were made up of local providers that were already accustomed to reporting claims to the state for billing purposes, this did not represent a change in reporting practice. This model of having a single community-organized health system

[5] There are some Medicaid recipients in these counties that are excluded from managed care. They include those in nursing facilities or psychiatric facilities for an extended stay, those served under home and community-based waivers, and those who must spend down to meet eligibility income criteria.

[6] Currie and Fahr (2005) cite reports from the Health Care Financing Administration that classify the Medicaid managed care penetration rate in Kentucky as over 50 percent in 1992, 1993, and 1994. This is likely due to Kentucky Medicaid's primary care case management program (KENPAC) where recipients are assigned a specific primary care provider. Although a primary care "gatekeeper" physician is one part of most managed care programs, we do not consider this feature alone to be enough to characterize a plan as being managed care. The fact that the state had to obtain CMS approval before introducing Passport and KHS suggests the same thing. One challenge facing any national Medicaid study is in understanding the institutional details of the programs in each state.

(COHS) manage care in a given region without accepting commercial bids was one of several models used in California to implement Medicaid managed care.[7]

The region 5 partnership dissolved within two and a half years of its introduction. Today Medicaid recipients in region 3 are still covered under the Passport managed care plan, while Medicaid recipients in the rest of the state (including recipients in region 5) are covered under Fee-For-Service (FFS) Medicaid.[8] Table 1 provides trends in overall and managed care eligibility over time. The table suggests that these two regions account for almost half of the state's total population and roughly 35 percent of the state's Medicaid population. Table 1 also suggests that Medicaid is an important potential source of insurance coverage in Kentucky. Our analysis will focus on the heterogeneous impact of Passport and KHS in their respective regions over a 30 month time period, January 1997-June 1999.

***State Capitation Payments to Passport and KHS***

Both Passport and KHS were given the responsibility of providing comprehensive health care coverage for their Medicaid enrollees in exchange for capitation payments (flat monthly fees per recipient based on their category of eligibility) negotiated with the state. In each region, separate monthly capitation rates were negotiated for six different eligibility categories: ADFC/TANF, SOBRA, children in foster care, SSI eligibles with Medicare, SSI eligibles without Medicare, and SCHIP. The monthly capitation rates for most of the timeframe we analyze in this paper are presented in Table 2. These capitation rates were based in part on

[7] As is discussed in Duggan (2004) and Aizer, Currie and Moretti (2007), California also used competition between one commercial plan and one private not-for-profit, Medicaid only HMO to select a single managed care provider in some counties. A third model used in some California counties, the Geographic Managed Care (GMC) approach, was to contract with several commercial HMOs and provide individual recipients in a county with choices.

[8] The discussion of the history and institutional structure of the Passport and KHS health plans presented here draws in large part from Bartosch and Haber (2004), a report completed by RTI International for the Centers for Medicare & Medicaid Services.

Medicaid FFS utilization data from State Fiscal Years 1995 and 1996.[9] Due to higher historical utilization patterns, Passport initially received higher capitation rates for almost every eligibility category (November 1997 to June 1998). However, in fiscal year 1999 the rates were adjusted so that the KHS capitation rates in many eligibility categories exceeded the Passport rates. Appendix Table 1 presents a list of the services covered under these capitation payments and those excluded for both plans. The excluded services were to be covered by the state directly through FFS reimbursement or capitated through a separate waiver.

***Plan Reimbursement for Providers***

The two plans selected very different reimbursement mechanisms for their providers. Passport elected to reimburse primary care providers (PCPs) on a capitated basis, with the capitation rate adjusted for the age, gender, and eligibility mix of their patients (SSI beneficiaries dually-eligible for Medicare and Medicaid were excluded from capitation). PCPs were at risk for primary care services only, while certain services including prenatal care, EPSDT services, and immunizations would be reimbursed on a FFS basis. In addition, PCPs were eligible for performance-based bonuses based on such activities as extending office hours, maintaining an appointment reminder system, accepting new patients, and meeting goals for utilization of emergency room visits, inpatient days, and specialty referral costs. In order for Passport to better measure resource use, an encounter claims bonus of roughly $1 for every non-FFS claim submitted was also established for PCPs. Hospital reimbursement was set up on a per diem basis using the Medicaid fee schedule with a 10 percent withhold.[10]

KHS instead elected to reimburse physicians and hospitals on a FFS basis using the Medicaid fee schedule with a 20 percent withhold. This means that physicians would receive 80

[9] See Bartosch and Haber (2004) for a detailed description of determinants of the capitation rates in Kentucky.
[10] The current Medicaid fee schedule for Kentucky is available at the following URL: http://chfs.ky.gov/dms/fee.htm

percent of the fee associated with each service performed and the remaining 20 percent was held back until the end of the year to be used as a potential reward for meeting budget targets. PCPs were organized into "pools of doctors" or PODs with each POD assigned a budget by KHS. If actual health care expenditures attributed to the POD exceeded the budget, then the proportion of the 20 percent withhold returned to the POD at the end of the year would be reduced. If the POD came in under budget, then the entire withhold would be returned as well as the surplus.

***Summary of the Key Differences between the Plans***

As described above, a key difference between the two plans was the way in which physicians were reimbursed. Passport used capitation, while KHS opted for FFS with a 20 percent withhold. It is reasonable to assume that this created very different financial incentives for providers in the two regions. Under the Passport plan, the marginal revenue generated for a PCP from an additional office visit is essentially zero. On the other hand, PCPs still received additional revenue from additional visits under the KHS plan. Although the withhold may have encouraged some utilization reduction, it is important to note that this bonus was not measured at the level of the individual provider. Therefore, each individual physician may have had an incentive to "free ride" off of the utilization reductions generated by other members of their POD, while keeping their own schedule full.

Another key difference between the two plans was the way in which they performed basic administrative functions, such as claims processing, member/provider services, case management, and information sharing. Passport opted to outsource these responsibilities to an administrative service organization (ASO), AmeriHealth Mercy Health Plan, based in Philadelphia. KHS decided to handle these responsibilities internally, despite a lack of experience at managing a managed care network. To the extent that managed care plans reduce

utilization/spending through increased coordination of care and careful review of physician practice patterns, experience in these basic administrative functions may be crucial. Passport's choice to outsource these functions to an experienced ASO may have contributed to its relative success at reducing utilization among its enrollees.

These initial choices made by Passport (capitating reimbursement for PCPs and outsourcing important administrative functions to an experienced ASO) created a plan that was in many ways much closer to a "textbook" HMO than the KHS plan. Thus, we would anticipate Passport to be more successful at reducing utilization than KHS. As we discuss further below, this motivates our "heterogeneous treatment" approach of modeling the impact of managed care separately in each region.

## III. Literature Review and Our Contributions

While there is no shortage of academic papers examining the impact of managed care on health care utilization and expenditures, as pointed out in Luft (1981), Miller and Luft (1994), Miller and Luft (1997), and Glied (2000), the vast majority suffer from the inability to identify the "pure" HMO effect due to enrollee selection. Glied (2000) provides a thorough review of the literature and concludes that most studies rely on multivariate controls to attempt to remove the effects of selection on the results. One obvious exception that focuses on the working age population is the RAND Health Insurance Experiment, which used random assignment into managed care (Manning et al. (1984)). The RAND experiment found managed care enrollees had overall lower health care utilization and expenditures, with fewer hospital admissions and similar use of outpatient services. As mentioned in Glied (2000), these results are broadly consistent with the nonrandomized studies summarized in Luft (1981). Mello, Stearns, and Norton (2002)

review the literature on Medicare managed care and find similar results for the Medicare population in their own analysis using simultaneous equations methods.

Kaestner, Dubay, and Kenney (2005) review the literature of the effects of Medicaid managed care on health care utilization and health outcomes. The results here are generally mixed and suffer from the same problems as the general literature on managed care. There are a few recently published studies that take advantage of California county-level Medicaid managed care mandates in a similar fashion to our paper. Duggan (2004) examines the impact of managed care on Medicaid spending and birth outcomes. Aizer, Currie, and Moretti (2007) also examine the impact of managed care on birth outcomes.

There are several differences between the Kentucky reform and the California reform that we exploit to our advantage. First, unlike in Kentucky, the California Medicaid managed care data used in the literature has no information on utilization for Medicaid managed care recipients. Duggan (2004) focuses on Medicaid capitation payments rather than utilization in his individual level analysis and looks at birth outcomes at the county level using hospital discharge data rather than Medicaid claims data. Aizer, Currie, and Moretti (2007) focus on birth outcomes, rather than overall utilization, using the California Birth Statistical Master File and Birth Cohort files. A second issue with the California Medicaid data is that the mandates for managed care were not binding for much larger groups of recipients and services than in Kentucky. For example, in some California counties undocumented workers, SSI recipients, and foster children were not required to participate in Medicaid managed care. In Kentucky, Medicaid managed care is mandatory for SSI recipients and foster children if they live in any of the managed care counties. Both California papers attempt to deal with this issue in their analysis

of birth outcomes by focusing on those in their data for whom the managed care mandate is most likely to be binding.

Our empirical approach also differs from the previous literature in several important ways. First, we focus on health care utilization, rather than expenditures. Therefore, our paper is most closely related to the Duggan (2004) individual level analysis of the impact of managed care on Medicaid expenditures (as measured by state capitation payments). Economic theory makes stronger predictions about the impact of managed care on utilization (Q) relative to expenditures (P*Q), because it is often harder to predict or measure how managed care will affect health care prices (P). Second, we focus on children continuously enrolled in Medicaid for the entire 30 month time period analyzed. Third, we account for migration endogeneity. Fourth, we are starting with much more homogenous treatment and control groups than previous work and we use the same individual recipient data to examine changes in utilization and health outcomes for children with asthma. Finally, we bring in outside data from the CPS to examine changes in Medicaid take up rates for children along the extensive margin.

## IV. Methods and Identification Strategy

### *Identifying the Impact of Medicaid Managed Care*

It is well recognized by health economists that selection bias represents a key barrier to assessing the impact of managed care on utilization. In many settings, especially in the private market, consumers have the choice between some form of a managed care plan and a FFS plan. Since the managed care plan represents the cheaper, but less generous option, it will tend to be more attractive to healthier individuals.[11] We refer to this as "enrollee selection." Thus the lower

[11] Cutler and Reber (1998) show that younger and healthier individuals at Harvard switched to less generous health plans after cost-sharing arrangements were changed, leading to an "adverse selection death spiral."

costs per managed care enrollee may reflect more stringent financial incentives on providers and alternative delivery methods, a healthier pool of participants (enrollee selection), or both. To identify the "pure" HMO effect one needs to keep the health composition within each type of plan constant, and, in general, OLS estimates will fail to do so and thus overstate the pure HMO effect.

In the context of public health insurance, especially Medicaid, the selection issues are perhaps somewhat different. The Medicaid population is poor and typically faces no copayments, premiums, or deductibles. In some contexts – such as the California Medicaid managed care setting that Duggan (2004) and Aizer, Currie and Moretti (2007) studied – recipients were initially able to voluntarily choose Medicaid managed care or stay in FFS, and then some California counties later mandated managed care enrollment. At least in the voluntary setting, it is not clear that the financial incentives to be in a managed care plan are very strong because Medicaid FFS plans tend to have little patient cost-sharing. Thus, it is not clear whether the selection bias will be the same as in the private setting.

In the Kentucky context, the switch from FFS to managed care was mandatory for a large portion of the Medicaid population, occurred at essentially one point in time, and was implemented in some, but not all Kentucky counties. In other words, a Medicaid recipient could not simply choose to opt into a managed care program, instead enrollment was based purely on county of residence. Therefore, enrollees in certain counties were automatically enrolled in managed care, while those in neighboring counties outside the managed care boundaries were not. This description of managed care implementation in Kentucky suggests a "difference-in-differences" approach to identify the impact of managed care on health care utilization that is free from the "enrollee selection" that plagues much of the literature.

One option for implementing this "difference-in-differences" approach would be to collect monthly enrollment and utilization data on all Medicaid enrollees in all 120 Kentucky counties before and after the reform. We could run a regression with an indicator of any monthly utilization as the dependent variable and an indicator of managed care enrollment, which would equal zero for all recipients in the pre-period and equal one for those living in one of the 37 managed care counties in the post period, as the independent variable. Thus we would be comparing the monthly utilization of those living in the 37 managed care counties before and after the reform with those living in any of the other 83 counties (see Figure 1).

While such an approach would shed light on the impact of managed care, it suffers from several problems. First, it would treat managed care counties containing Kentucky's largest cities (Louisville in Jefferson county and Lexington in Fayette county) the same as much more rural managed care counties. In addition, these cities served as the "hub" for managed care activities within their respective regions, so they are also different from more rural areas in that regard. It may be the case that because Jefferson county contains Louisville, it is too different from other Kentucky counties for any comparison to be feasible. Second, it may not be reasonable to use counties in the far eastern or western parts of the state as controls for managed care counties in central Kentucky. Table 3 provides a descriptive comparison of each of the eight proposed managed care regions using "QuickFacts" data from the U.S. Census and confirms that there are important differences between the regions.[12] Third, there are also important differences in utilization patterns in adults versus children, so an analysis of all enrollees would ignore these differences. Finally, it does not address the potential endogeneity of residence. Enrollees may

[12] Table 3 suggests that the Passport region (region 3) has a lower percentage of white inhabitants than any other region and is among the highest in terms of high school graduation rates. The KHS region (region 5) has the second lowest percentage of white inhabitants and the lowest homeownership rate. The poverty rate in both managed care regions is much lower than in regions 4, 7, and 8.

move across county lines in order to opt in or opt out of managed care. We refer to this as "migration endogeneity."

Given these concerns, an alternative approach would be to focus our attention on enrollees in the outermost counties in both managed care regions that share a border with a FFS county. These outermost managed care counties and their FFS neighbors are likely to make for much more homogenous treatment and control groups than would be the case if we used all 120 counties. These outermost managed care counties are also more likely to have been "followers" rather than "leaders" in terms of setting managed care policy for their regions. This "border county" approach is motivated by, among others, the Black (1999) analysis of the effects of school test scores on housing prices. By looking at geographic areas that are contiguous and relatively homogeneous - yet are treated very differently by the implementation of managed care - we feel more confident that any measured impacts do not represent other omitted county-level factors.

In order to address migration endogeneity, we use managed care eligibility based on county of residence in January 1997 as a proxy for actual managed care enrollment. Presumably, choice of residence in January 1997 is exogenous to the implementation of the Medicaid managed care that occurred in November 1997. We also follow the literature and focus on our attention on children, specifically children enrolled continuously from January 1997 to June 1999.[13]

[13] Some studies analyze individuals with Medicaid spells as short as one month, yet there are a number of challenges with using short Medicaid spells to measure the impact of managed care. First, Medicaid eligibility changes are often associated with other changes in socioeconomic circumstances (such as changes in income, private insurance status, and marital status of the parent) that are difficult to observe in administrative data but may independently affect health care utilization. For example, children who newly enroll in Medicaid due to a drop in parent's income (and perhaps loss in private health insurance) may have utilization that is incorrectly attributed to the managed care or FFS arrangement rather than the drop in income. On the other hand, children who are made eligible for Medicaid due to marital dissolution may be less likely to use health care due to the increased time constraints on the single parent. Second, lagged insurance coverage could affect current utilization. For example,

While this alternative approach is promising, there is one final issue to be addressed: whether or not it makes sense to model the managed care "treatments" in each region as being homogeneous. The description of the differences in implementation across the two regions suggests that we should model the impact of managed care in each region separately. Our use of separate border county FFS control groups for each region should handle other baseline differences between the two regions, such as differences in baseline utilization.

To summarize our empirical strategy, we define separate treatment and shared-border control counties for each of the two managed care regions and track the utilization of all children that i) live in those counties in January 1997 and ii) are continuously enrolled in Medicaid until June 1999. Figure 2 illustrates the 4 Passport treatment and 7 control counties as well as the 9 KHS treatment and 14 control counties used in this analysis.[14] Table 4 provides a descriptive comparison of the treatment and control counties using "QuickFacts" data from the U.S. Census. The first two columns describe the Passport treatment and control counties, followed by the KHS treatment and control counties. We also present descriptions of Passport and KHS counties that share a common border. For both Passport and KHS, the treatment and control counties are very

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uninsured children who enroll in Medicaid may initially have increased utilization due to pent-up health care demand, yet this could be incorrectly identified as a HMO effect. Third, as Cutler and Gruber (1996) note, there are children who are eligible, but not participating in the Medicaid program who might be viewed as having conditional Medicaid coverage. What this means is that when the child gets sick, it may be relatively easy to enroll the child in Medicaid. Similar to the pent-up demand story, conditional coverage may incorrectly attribute utilization to managed care or FFS plans. For each of these reasons, the results from an analysis of non-continuous enrollment spells are likely to be biased if there are differential take-up rates in managed care and FFS counties. Although we observe long-run insurance status and utilization far more accurately than previous work, by restricting the sample of Kentucky children to those who were continuously enrolled, it is likely that the children are poorer and less mobile than other Medicaid recipients. In order to evaluate this formally, we examined data from the Survey of Income and Program Participation (SIPP) from 1997-1999. We find that children continuously enrolled in Medicaid tend to be more disadvantaged than those with intermittent Medicaid enrollment. Additionally, sources of health insurance coverage for these children when not formally participating in the Medicaid program varied with the length of time spent on Medicaid. This suggests that our results based on continuously enrolled children may not be generalizable to the Medicaid population as a whole.

[14] The Passport treatment counties are Breckinridge, Grayson, Larue, and Marion and the control counties are Hancock, Ohio, Butler, Edmonson, Hart, Green, and Taylor. The KHS treatment counties are Lincoln, Rockcastle, Jackson, Estill, Powell, Montgomery, Nicholas, Harrison, and Owen and the control counties are Pulaski, Laurel, Clay, Owsley, Lee, Wolfe, Menifee, Bath, Fleming, Robertson, Bracken, Pendleton, Grant, and Gallatin.

similar in terms of measurable county-level characteristics. Observable differences across the two regions further motivate separate Passport and KHS analyses. Finally, it is interesting to observe how similar the Passport and KHS counties are that share a common border. Later we compare the impact of the different managed care "treatments" in each these two similar sets of counties.

***Empirical Model Specification for Analyzing Changes along the Intensive Margin***

As mentioned above, the key issue which motivates the instrumental variables approach we adopt in this paper is that mobility across Kentucky's 120 counties is non-trivial, and could be correlated with the implementation of Medicaid managed care. Put differently, location could be endogenous to health care utilization and Medicaid generosity. In the broader literature on welfare benefits, Gelbach (2004) convincingly finds that among women likely to use welfare, movers move to higher-benefit states, and do so earlier in the life cycle. If one believes that state-to-state moves occur due to differences in cash welfare generosity, then county-to-county moves (which are clearly less costly for families) due to differences in Medicaid generosity may be an important issue to account for.

To do so, we argue that county of residence in January 1997 is exogenous to the implementation of the Medicaid managed care that occurred in November 1997. Thus, we predict managed care enrollment separately in each region based on the interaction of two variables: time period (pre- or post-implementation) and whether the initial county of residence becomes a managed care county. In other words, in each region we are using managed care eligibility based on county of residence in January 1997 as an instrument for actual managed care enrollment. This exogenous eligibility measure should not affect health care utilization except through its effect on actual managed care enrollment.

Our first stage models for each region, estimated as linear probability models, are given below:

$$HMO_{ijt} = \beta_0 + \beta_1 HMO\_elig\_Passport\_initial\_county_{it} + \beta_2 Age\_6\text{-}12_{it} + \beta_3 Age\_13\text{-}18_{it} + Month\_Year\_Dummies\ \beta_4 + \alpha_i + \varepsilon_{ijt} \quad (1a)$$

$$HMO_{ijt} = \beta_0 + \beta_1 HMO\_elig\_KHS\_initial\_county_{it} + \beta_2 Age\_6\text{-}12_{it} + \beta_3 Age\_13\text{-}18_{it} + Month\_Year\_Dummies\ \beta_4 + \alpha_i + \varepsilon_{ijt} \quad (1b)$$

where *HMO* represents actual managed care enrollment for child *i* in county *j* at time *t*, *HMO_elig_Passport_initial_county* represents Passport eligibility for child *i* based on initial county of residence and current time period (i.e. it equals 1 if the child initially resided in a Passport county, and the time period is November 1997 onward), *HMO_elig_KHS_initial_county* represents KHS eligibility for child *i* based on initial county of residence and current time period, and *Month_Year_Dummies* is a vector containing an indicator for each of the 30 months (January 1997 to June 1999) in our sample.[15] We also include two indicators for different child ages, child fixed effects ($\alpha_i$), and $\varepsilon_{ijt}$ represents a standard error term. The inclusion of child fixed effects controls for time-invariant child characteristics that are not observed in our administrative data.

Our second stage, which examines three types health care utilization (professional, outpatient, and inpatient services), is also estimated as a separate linear probability model for each region:

$$Any\_Monthly\_Utilization_{ijt} = \beta_0 + \beta_1 HMO_{ijt} + \beta_2 Age\_6\text{-}12_{it} + \beta_3 Age\_13\text{-}18_{it} + Month\_Year\_Dummies\ \beta_4 + \alpha_i + \varepsilon_{ijt} \quad (2)$$

[15] Recall that a child must be enrolled in Kentucky Medicaid for all 30 months in order to be included in our sample. Therefore a child that moves from Kentucky to another state would not be included even if their Medicaid coverage across the two states was uninterrupted.

where $Any\_Monthly\_Utilization_{ijt}$ is a dummy variable equal to 1 if child *i* in county *j* used one of our measures of health care utilization in month *t* (outpatient, professional, or inpatient), *HMO* represents actual HMO enrollment in our OLS specifications and predicted HMO enrollment from the first stage in our IV specifications, and the other variables are defined as before.[16]

***Empirical Model Specification for Analyzing Changes along the Extensive Margin***

Although our Medicaid administrative data allows us to precisely measure health care utilization for children, one limitation is that it is less useful for measuring impacts along the extensive margin, i.e., the decision to participate in Medicaid. If one views switching from FFS to managed care as implicitly reducing the generosity of Medicaid, then one may expect both reductions in utilization (which we measure with the administrative data) and reductions in program participation.[17] Focusing on utilization alone may therefore ignore an important part of the cost-savings from switching to managed care and a margin of adjustment that may also be important to policymakers.

Because we rely on the household-based March Current Population Survey (CPS) to examine participation, our empirical approach is somewhat different than for the intensive margin. We focus on repeated cross-sections of children under age 18 from Kentucky, and estimate linear probability models of the form:

$$INSURANCE_{ijt} = \beta_0 + \beta_1 HMO\_elig\_current\_county_{it} + X_{ijt}\beta_2 + Year\_Dummies\ \beta_4 + Region\_Dummies\ \beta_5 + \varepsilon_{ijt} \quad (3)$$

where $INSURANCE_{ijt}$ represents Medicaid coverage, private coverage, or no coverage, and is a dummy variable equal to 1 if the child had that coverage at any time during the previous calendar

[16] For a discussion of the use of linear probability models in two state least squares estimation see Angrist and Krueger (2001) and Kelejian (1971).

[17] Yelowitz (1998) found that the rising value of Medicaid for the SSI-disabled population was responsible for 20 percent of caseload growth from 1987 to 1993.

year. Since the dataset is cross-sectional, we cannot observe county-to-county moves over time in the CPS; instead we construct $HMO\_elig\_current\_county_{it}$, a population-weighted probability that the child currently resides in a managed care county (and thus would be forced to participate in managed care if the child enrolled in Medicaid). This probability varies, of course, over time, and also because we observe larger metropolitan areas rather than individual counties.

Approximately 42 percent of CPS respondents live in one of three metropolitan areas: the Louisville MSA, the Lexington MSA and the Cincinnati MSA (which includes northern Kentucky). The remaining 58 percent live in unidentified counties in Kentucky, and some of these unidentified counties also participate in Medicaid managed care. All children are assigned a probability of zero for *HMO_elig_current_county* in 1996 and 1997 (since Medicaid managed care began in November 1997); children in the Louisville MSA are assigned a probability of 1 from 1998 to 2002. Children in the Lexington MSA are assigned a probability of 1 in 1998 and 1999, and 0 thereafter. Children in the Cincinnati MSA are always assigned a probability of 0.

The remaining children (which make up more than half the sample), are spread amongst counties that are in the Passport region, the KHS region and other non-managed care regions. Based on population, the Louisville MSA contains about 70 percent of the total Passport beneficiaries, and the Lexington MSA contains about 65 percent of the total KHS beneficiaries. Thus, a significant number of managed care beneficiaries are present in the unidentified counties. For children in unidentified counties, we assign to *HMO_elig_current_county* a population-weighted probability of living in a managed care county of 0.256 in 1998 and 1999, when both Passport and KHS were in operation. This probability drops to 0.141 from 2000 to 2002, when KHS ceased operations and the Lexington region switched back to FFS coverage.

With these probabilities, the coefficient $\beta_1$ measures the marginal impact of switching to Medicaid managed care on Medicaid participation, private insurance coverage, and no insurance. The vector $X_{ijt}$ measures child- and family-characteristics reported in the CPS, including child's age (measured linearly), sex, race, the family's income (dummies for under 100 percent of poverty, between 100-200 percent, between 200-300 percent, and over 300 percent), and family homeownership status. The models also include fixed effects for calendar year (1996-2002) and geographic regions (Louisville MSA, Lexington MSA, Cincinnati MSA, and unidentified). In the results section, we present a variant of equation (3) where we include, in addition to the calendar year and region dummies, a region-specific time trend. We also present results excluding imputed values for health insurance coverage. Finally, we present a "difference-in-difference-in-differences" specification in which we interact *HMO_elig_current_county* with poverty status in order to assess whether or not the impact of the introduction of managed care varies by family income.

## V. Data

### *Intensive Margin*

In order to implement our empirical analysis of changes along the intensive margin, we were provided with de-identified, linked Medicaid claims and enrollment data by the Kentucky Cabinet for Health and Family Services. As described above, for each region our sample consists of children that i) live in the region's treatment or control counties in January 1997 and ii) are continuously enrolled in Medicaid until June 1999.[18] During these 30 months, there were no changes in the company managing the Kentucky Medicaid information systems.

[18] Note that we are not requiring these children to live continuously in one of the treatment or control counties, only that they maintain Kentucky Medicaid enrollment. Therefore, a child may live in a Passport treatment county in

Electronic Data Systems (EDS) was responsible for managing Medicaid information systems for Kentucky from 1994 to 2000 and a new vendor, Unisys, began managing these databases in January 2000. During transitions to new vendors with new database models, the medical claims information goes through a testing and verification period for about one year. We are not confident in the comparability of the new Unisys database with the previous system during this intermediate period, which is why we end our analysis in June 1999 (several months before the transition). The benefits of using this timeframe include the fact that it spans the reform we are investigating and we are assured the changes in utilization we observe are not being driven by vendor changes. The cost is that we cannot observe longer-run utilization changes.

After dropping a few children with age discrepancies, we are left with 4,706 children in our Passport sample (1,890 initially in one of the 4 Passport treatment counties we are interested in and 2,816 initially in one of the 7 control counties) and 13,590 children in our KHS sample (4,273 initially living in one of the 9 KHS treatment counties we are interested in and 9,317 initially living in one of the 14 control counties). Descriptive statistics from our final samples for each region (split into treatment and control sample sub-categories) are shown in Table 5. Comparing the 1,890 children initially in a Passport county with the 2,816 initially in a bordering FFS county, we see that there was a slightly lower probability of moving across county lines among the Passport children (24 percent versus 26 percent). On the other hand, there are more movers among the children initially in a KHS county than their FFS controls. The amount of moving that we observe in both regions reinforces the motivation for our IV approach to control

January 1997 then move to any other part of the state for the remaining 29 months in our analysis and stay in the sample, as long as they maintain their public coverage.

for migration endogeneity.[19] Table 5 reinforces the finding from Table 4 that we are comparing extremely homogenous sets of counties within each region. The children in our final Passport and KHS samples appear extremely similar to their FFS controls in terms of demographics and pre-reform utilization.

Our health care utilization data – which is recorded regardless of whether the payment arrangement is FFS or managed care – is at the monthly level. Inpatient services are defined to be services delivered in a hospital with an overnight stay, while outpatient services are services delivered in clinics or hospitals in which there is no overnight stay (such as an ER visit). Professional services typically represent physician services, but could also include services provided at locations other than physician offices, such as dental clinics and public health clinics. The bottom of Table 5 presents the monthly utilization rates for each type of service in the pre-period (January 1997-October 1997) and the post-period (November 1997-June 1999) for children in each set of counties of interest. These simple summary statistics in many ways tell the entire story. We see large reductions in outpatient and professional utilization for children initially living in the Passport counties that is not matched by children initially living in the non-Passport border counties. Children initially living in the KHS counties, while experiencing some reduction in outpatient utilization, actually have a slight increase in professional utilization. They tend to look much more similar to children initially in the non-KHS border counties (i.e., children continuing to receive FFS Medicaid).

[19] These high mobility rates can be corroborated with other data sets. Using the 43,111 unique Kentucky respondents in the 2008 American Community Survey (ACS), we find that nearly 16 percent of the sample moved in the last year, with approximately 80 percent being within-state moves. Almost half of the within-state moves were from one of Kentucky's 30 Public Use Microdata Areas (PUMA) to another. In the ACS, migration rates were higher among children (17 percent moved), and especially high among poor children (26 percent moved).

The heterogeneous impact of the two different managed care "treatments" is made especially clear in Figures 3 and 4. Figure 3 compares for each of the three types of services differences in the monthly utilization rate for the 1,890 children initially living in a Passport county (labeled "treatment") to the utilization rate for the 2,816 children initially living in a non-Passport border county (labeled "control"). We see similar utilization rates in the pre-period for each type of service and then striking reductions in outpatient and professional utilization for the Passport treatments relative to their controls. There seems to be less of a managed care impact on inpatient utilization, but the extremely low baseline utilization rate makes the possibility of a significant reduction less likely, as does the fact that inpatient stays were still reimbursed on a FFS schedule with a withhold, rather than on a capitated payment.

Figure 4 provides the same comparison for our KHS treatment and control samples. These graphs clearly tell a different story. We again see similar utilization rates between the treatment and control counties in the pre-period. The KHS pre-period utilization rates also appear to be very similar to the Passport pre-period utilization rates, with slightly lower outpatient and professional rates and a slightly higher inpatient rate. In the post-period, we see very little difference between the KHS treatment utilization rates and the controls. Therefore, these graphs suggest a very strong impact of the managed care treatment associated with the Passport program and almost no impact of the managed care treatment associated with the KHS program. Our empirical results presented in the next section will formalize these findings.

***Extensive Margin***

To examine Medicaid participation, we must rely on non-administrative data, since our administrative data only follows children when they are participating in Medicaid. Children can become ineligible for Medicaid for many reasons including increases in family income, changes

in family structure, aging out of an eligibility group, moving out of the state, and obtaining private health insurance. In order to examine the impact of managed care on Medicaid participation, we rely on the 1997-2003 March CPS Annual Social and Economic Survey (ASEC) (U.S. Department of Commerce, Bureau of the Census, 2003). We use a larger set of years for this analysis because the CPS questionnaire was uniform over the entire period, and by using all of these years, we are able to exploit a longer "pre-" period, as well as exploiting the fact that managed care was eventually repealed in the KHS region.

The ASEC asks detailed questions about health insurance for the entire previous calendar year. Thus, our dataset contains information on the 1996 to 2002 time period. Health insurance status is asked for all household members; the survey includes questions about employer-provided health insurance, private health insurance, and government insurance. The CPS does not directly ask people whether they are uninsured, rather it asks about specific types of insurance and respondents who answer "no" to all of the categories are considered uninsured. It asks respondents about coverage at any time during the preceding calendar year, so being uninsured reflects a lack of health insurance throughout the entire previous calendar year. In the analysis that follows, we use health insurance definitions identical to those of the Census Bureau.[20]

We initially extracted 13,990 Kentucky respondents – both children and adults – from the March 1997 to 2003 CPS. In our empirical results, we restrict attention to the 27 percent of respondents (3,839 respondents) that were under the age of 18. Approximately 42 percent of these respondents lived in the Louisville, Lexington or Cincinnati metropolitan areas and the

[20] To be more specific, the CPS explicitly asks about private insurance coverage, employer-based coverage, employer-based coverage in one's own name, direct privately purchased insurance, Medicare, Medicaid, and CHAMPUS. It defines "uninsured" as not being in any of the other categories. The health insurance definitions can be found at: http://www.census.gov/hhes/hlthins/hlthinsvar.html

remainder lived in unidentified areas. More than 28 percent of these respondents had some form of imputed information on health insurance; as a result, we estimate all specifications both including and excluding imputed values.[21]

Over the entire 1996 to 2002 time period, among children under 18, roughly 23 percent participated in Medicaid, 64 percent had private insurance and 12 percent were uninsured.[22] Medicaid coverage among children fell from 25 percent in 1996 and 1997, to 18-20 percent in 1998 to 2000, and then increased again to 24-25 percent in 2001 and 2002. Although this pattern is certainly consistent with the implementation and repeal of managed care affecting Medicaid participation, clearly other factors matter as well. Kentucky – like the rest of the United States – was experiencing substantial economic growth in the late 1990s, and then that growth stopped with the 2001 recession. The unemployment rate in Kentucky fell from 5.1 percent in 1996 to 4.1 percent in 2000, but increased to 5.6 percent by 2002.[23]

## VI. Results

### *Passport (Louisville area HMO) - Intensive Margin*

The top panel of Table 6 presents the results of a series of regressions based on equation (2) for the Passport region where the dependent variable in each model is a (0, 1) indicator of any monthly utilization of professional, outpatient, or inpatient Medicaid services. The key independent variable of interest is managed care enrollment (*HMO*). In order to isolate the effect of the Passport managed care program on utilization, each model includes a series of month year

[21] Bollinger and Hirsch (2006) find that in the context of earnings in the CPS, coefficient bias due to the imperfect imputation is widespread and often severe. They suggest, in the context of earnings, that a simple alternative is to exclude imputations, and base estimates on a respondent-only sample.
[22] When examining the non-imputed values, private coverage was somewhat lower, and Medicaid coverage and no coverage were somewhat higher.
[23] For more detail, see the following BLS website: http://www.bls.gov/schedule/archives/all_nr.htm#SRGUNE

dummies and child fixed effects. The OLS estimate presented in column 1a suggests that the introduction of the Passport program led to a statistically significant 16 percentage point decline in the probability of any Medicaid professional utilization for the children in our sample. This is relative to a monthly professional utilization rate of 36% in the pre-reform period, thus representing a 44% reduction in the overall monthly probability of any Medicaid professional utilization. The other OLS estimates suggest a statistically significant 6 percentage point decline (66% reduction) in the monthly probability of any outpatient utilization and a more modest 0.1 percentage point decline (18% reduction) decline in the monthly probability of any inpatient utilization.

Identification in the OLS models is achieved through the assumption that this Medicaid reform in Kentucky is an exogenous change to insurance type, not driven in a given county by some sort of related changes in Medicaid spending / utilization (policy endogeneity) or because of changes in the characteristics of recipients (migration endogeneity).[24] In our IV models we address migration endogeneity by instrumenting actual managed care enrollment with Passport or KHS eligibility based on initial county of residence. Because we first observe each child in our sample in January 1997, our identifying assumption is that their county of residence in January 1997 is exogenous to the implementation of managed care in November 1997.

Appendix Table 2 presents the results of the first stage regressions in which Passport or KHS eligibility based on initial county of residence is used to predict actual managed care enrollment (*HMO*). The instrument is clearly a very strong predictor of actual managed care enrollment with a marginal managed care participation rate of 69 percent for Passport and 79

[24] As is argued in Duggan (2004) in the case of California, one could argue in Kentucky that since the planning for the introduction of managed care preceded the actual implementation by multiple years, policy endogeneity is unlikely to be a major issue. Moreover, the cost dynamics in these border counties are likely to have been far less important in policy decisions than the urban centers of the managed care regions.

percent for KHS. The estimated marginal take-up rate is not 100 percent in either case because of difficulty in measuring managed care enrollment in the first 4 months of the reform and some children moving across county lines, potentially into the adjacent managed care area.[25]

How does the instrument impact the second stage results? The results reported in Table 6 suggest that using an IV approach leaves the coefficient estimates largely unchanged. There is no change in the predicted impact on outpatient services and a slightly larger predicted impact on professional services (17 percentage points versus 16 percentage points). The predicted impact on inpatient utilization is no longer statistically significant at conventional levels. These results suggest that migration endogeneity is not a major source of bias to our OLS estimates of the impact of Passport on health care utilization. Although we do observe children moving, those moves do not appear to be motivated by differences in Medicaid across counties.

Overall, we see that the introduction of Passport led to relatively large reductions in outpatient and professional utilization, with slightly less statistical support for a reduction in inpatient services. Although inpatient services were still reimbursed via FFS in Passport, inpatient utilization might still be expected to fall due to better coordination of care and case management or due to an increased emphasis on preventive care. On the other hand, because our analysis is focused on children, we might not expect large reductions in inpatient utilization given the already low baseline inpatient utilization rate observed for our Passport sample (0.6%). A managed care program would likely have more success targeting outpatient and professional

[25] If none of the children in the sample left their county of residence in January 1997, then the indicator of actual managed care enrollment in the administrative dataset should be perfectly correlated with our eligibility indicator based on initial county of residence (because managed care enrollment is based on county of residence). Table 5 indicates that children do move across counties within the state, so we did not expect a coefficient of 1 in the first stage. In addition, during the first four months associated with the introduction of the Passport and KHS, the administrative indicator for actual managed care enrollment does not always match up with the child's county of residence. For example, we observe a small number of cases where a child's county of residence is a Passport county, but the indicator of managed care enrollment is equal to zero (or the opposite situation) during these first four months.

service utilization for reductions among their child enrollees. Therefore, our Passport findings are in line with the general literature on managed care in terms of finding reductions in utilization, but the composition of those reductions differs due to the fact that we are focusing on children.

***Kentucky Health Select (Lexington area HMO) - Intensive Margin***

Table 6 also presents results of a similar specification estimated using our Kentucky Health Select (KHS) sample. The OLS estimate presented in column 1c suggests that the introduction of the KHS program actually led to a statistically significant 2 percentage point increase (6% increase relative to baseline) in the probability of any Medicaid professional utilization. The other OLS estimates suggest a statistically significant 2 percentage point decline (16% relative to the pre-reform baseline) in the monthly probability of any outpatient utilization and a marginally significant 0.1 percentage point increase (20% increase) in the monthly probability of any inpatient utilization. As was the case with our Passport analysis, using an IV approach leaves the KHS coefficient estimates largely unchanged, with a loss of statistical significance for the inpatient results. Therefore, these results also suggest that migration endogeneity is not a major source of bias.

Both Passport and KHS decreased outpatient utilization among the children in our sample, though Passport was able to do so to a greater degree (66% reduction versus 21% reduction). In addition, both programs appear to have had a minimal impact on inpatient care utilization for children, which, as mentioned, is not surprising given the low overall utilization of inpatient services for children. A key difference between the effects of the two programs is that Passport reduced professional utilization by 47%, while KHS actually increased professional utilization by 3%. As we will discuss in further detail below, this may be due to differences in

the way that each program reimbursed physicians. Recall that Passport set up a capitated system to reimburse local physicians, while KHS opted for FFS reimbursement with a 20 percent withhold.

***Comparing Treatment Border Counties - Intensive Margin***

As Figure 1 illustrates, the Passport and KHS regions also share a border, meaning that we can compare utilization pre- and post-reform for 5 Passport (Washington, Nelson, Spencer, Shelby, and Henry) and 4 KHS (Boyle, Mercer, Anderson, and Franklin) counties that were excluded from the previous analysis. The final two columns of Table 4 suggest that these counties are extremely similar, other than the managed care region they were assigned to. Figure 5 presents outpatient, professional, and inpatient utilization comparisons. The figure suggests similar utilization rates in both sets of counties prior to the reform, then stronger utilization reductions in the Passport counties relative to their KHS neighbors. These graphs therefore lend further support to the notion that the Passport plan was better able to reduce utilization than the KHS plan, and similar conclusions are found in regression analysis.

***Extensive Margin***

Table 7 presents the results on the impact of Medicaid managed care for children along the extensive margin. The first column, top panel shows that the implementation – and repeal – of managed care was associated with a highly significant and economically important decline in Medicaid participation. The reduced-form coefficient estimate implies that managed care reduced Medicaid participation by 10.5 percentage points, from a pre-reform baseline of approximately 25 percent. In the CPS time series, participation dropped by around 5 percentage points, suggesting that virtually all the drop in Medicaid participation occurred in the managed care regions. The first column, bottom panel shows that the no insurance coverage model

estimated coefficient is roughly equal and opposite in sign. Thus managed care appears to shift children from Medicaid coverage to being uninsured. These results are both highly significant.

One cause for concern, however, relates to the effects of managed care on private coverage: one might expect that if managed care implicitly cut the generosity of Medicaid, then children will leave Medicaid and either obtain private coverage or become uninsured. Yet, the coefficient in the private insurance coverage model is negative and marginally significant (first column, middle panel). These results on private coverage (as well as Medicaid and no coverage) are robust to a number of changes in the model specification: the second column includes region-specific time trends, and the third column includes these trends and excludes imputed values. In all three cases, the conclusion appears the same: the implementation of managed care reduces Medicaid participation and increases non-coverage by approximately the same amount, yet private coverage falls rather than rises.

To explore this result further, Table 8 estimates models the impact of managed care for poor and near-poor children, as well as higher-income children. These models use the same specification as in third column of the previous table. The first two columns stratify the sample by income and estimate identical "difference-in-differences" models as the previous table, while the third column estimates a "triple difference" model by interacting family income level with *HMO_elig_current_county* (HMO_CC). The final column shows that the entire effect of managed care on Medicaid participation was concentrated exclusively among poor and near-poor children, and that there was no effect on higher-income children. On the other hand, the "impact" of managed care on private coverage was the same for both higher-income and poor children and the impact of managed care on non-coverage was larger for poor and near-poor children than for higher-income children. The results for higher-income children strongly suggest that other state-

wide changes in the insurance market – besides managed care – affected health insurance coverage and were occurring in the Passport and KHS regions over time, differentially from the rest of the state. Nonetheless, the results on Medicaid participation are striking, and suggest that reducing the generosity of Medicaid reduces formal participation in the program.

***Impact of Managed Care on Health Outcomes***

Our Passport results provide compelling evidence that utilization can be reduced through the high-powered incentives provided in typical HMO arrangements. One common criticism, however, is that this reduction in utilization comes at a real cost: patients do not receive some of the appropriate or necessary care they were getting under FFS. Using our same IV framework, we examine utilization for asthmatic children. If Passport is providing poorer care for this vulnerable population, we would expect a higher hospitalization rate after Passport is implemented (Aizer and Currie (2002) & Aizer (2007)).

Table 9 provides regression results on utilization for various groupings of Kentucky counties. The first set of columns breaks out the 4,706 children from the 4 treatment and 7 control counties for Passport into 327 asthmatic children and 4,379 others.[26] As in the full sample, we see no statistically significant change in inpatient utilization for asthmatics. Asthmatics also have similar changes in outpatient and professional utilization. For comparative purposes, the second column reports the regression results for the non-asthmatic children.

Because the asthmatic sample size is relatively small, we expanded the sample in two ways. First, we expand the sample to include all 30 month enrolled children in all Passport counties as the treatment group and all 30 month enrolled children in all Region 4 counties to the south (see Figure 1) as the control group. As the second set of columns show, this increases the

[26] We define an asthmatic as a child with at least one occurrence of the ICD-9 code associated with asthma (493) in the 10 month pre-reform time period.

number of asthmatics to 2,042, but the basic conclusions do not change. Second, we also expand the sample by including all 30 month enrolled children in Regions 4 and 2 as the control group. The third set of columns show that this increases the number of asthmatics to 2,465. Again the results do not change. Because we find that hospitalizations did not go up for asthmatic children, we take this as suggestive, but certainly not conclusive, evidence that there were not detrimental health impacts associated with Passport utilization reductions. A full analysis of the health impacts of managed care is beyond the scope of this paper, but will be the subject of future research.

## VII. Specification Checks

In the previous section, we exploited the large initial size of our administrative dataset in order to create narrow treatment and control groups that overcame many of the standard objections that would arise in a quasi-experimental setting. By following the same set of continuously-enrolled children in geographically contiguous counties who were differentially affected by region-wide transitions to Medicaid managed care, our empirical approach is able to address concerns about omitted variables bias and endogeneity. In doing so, we find substantively large drops in utilization in the Passport region, but not in the KHS region.

In this section we consider a variety of specification checks to test the robustness of these results. First we consider how our conclusions would change if we used a larger, but more geographically diverse sample. Recall that our "Passport experiment" used only four of sixteen counties in Region 3 for the treatment group, as well as seven contiguous counties outside of Region 3 for the control group. The "KHS experiment" used nine of twenty-one counties in Region 5 for the treatment group, and fourteen counties outside of Region 5 for the control

group. In addition, given the differences in plan design, the managed care "treatment" was fundamentally different in the two regions.

Table 10 shows the results of expanding the sample using the same IV methods that were used in Table 6 (the coefficients from that table are presented in the first two rows of Table 10 as reference). We begin by combining the treatment regions, estimating the effect of managed care without regard to the underlying differences between the two regions. As might be expected, the treatment effect of managed care is essentially a weighted average of the treatment effects in the two managed care regions. Overall, professional utilization falls by 4 percentage points, far smaller than the 17 percentage point drop in the Passport region, but a substantially larger drop than the 1 percentage point increase observed in the KHS region. The conclusions for outpatient utilization mirror those for professional utilization, while the effect on inpatient utilization is in all cases insignificant. We conclude that ignoring the underlying incentives created by different forms of managed care can lead to very different conclusions about the magnitude of its effect on utilization.

Next, we expand our sample to include continuously-enrolled children in all Region 3 and Region 5 counties as the treatment group, and all continuously-enrolled children in the other six regions as the control group. It should be clear from the comparisons of the eight regions that doing so makes the treatment and control groups far more heterogeneous. Relative to the approach of focusing on geographically contiguous regions, our estimated impacts of managed care are roughly 15 to 20 percent smaller. We interpret this difference as suggesting that un-modeled, omitted factors are correlated with both the implementation of managed care and utilization in the larger sample; for example, it is possible that utilization trends in urban areas

trended differently over time than utilization in rural areas, and the urban areas also adopted managed care.

Up to this point, our analysis has focused on the impact of Medicaid managed care on the probability of any monthly medical utilization. Such an approach does not allow us to determine where on the distribution of medical spending any observed reductions in utilization are coming from. For example, is the 66% reduction in the monthly probability of consuming any outpatient services observed in the Passport region achieved by reducing utilization among "heavy" users of outpatient services? The regressions reported in Table 11 address this question for outpatient and professional services in the Passport region. We create new dependent variables equal to 1 in months where the child's professional or outpatient Medicaid spending exceed the $50^{th}$ percentile of the respective monthly spending distribution (conditional on having positive spending). In the first column, the dependent variable equals 1 in a given month if a child has professional service spending / claims above $50, and in second column the dependent variable equals 1 if in a given month a child has outpatient spending /claims above $100. The results show a 94% reduction in the probability of having monthly outpatient spending above $100. This suggests a far stronger impact of Passport on outpatient utilization for those with relatively high outpatient spending / claims. For professional services we see that Passport focuses on the left tail of the distribution. Passport leads to a 37% reduction in the probability of having any monthly professional spending above $50, as compared to a 47% reduction in the probability of having any monthly professional spending (Table 6).

Our final important specification check examines provider participation. Are the reductions in Passport utilization coming from reduced access to health care (i.e., fewer providers participating in the program), rather than more efficient delivery of services? A

managed care network would likely restrict the number of doctors, but were those restrictions so severe as to cause the reduction we observe? From the universe of Medicaid recipients in the treatment/control counties, we are able to extract unique provider identifiers. Figure 6 illustrates that although providers did not grow in the Passport counties (as they did in the control counties), they did not shrink either. The differences in levels seem to reflect population size differences. As a result, it is difficult to believe that the sharp drop in utilization is coming through reduced access.

## VIII. Conclusions

Many researchers have pointed out that simply comparing the utilization of managed care enrollees with the utilization of FFS enrollees may not be informative due to the ability of enrollees in many circumstances to choose their health plan. The observation that managed care plans have lower costs than FFS plans could be explained by managed care plans disproportionately enrolling lower utilization / lower cost customers. Therefore a question that has persistently plagued both researchers and policymakers alike is whether HMOs and other forms of managed care produce lower health care utilization through better aligned financial incentives and alternative delivery methods (the pure HMO effect) or by attracting more healthy enrollees (enrollee selection).

We shed new light on this question of the "pure" HMO effect versus "enrollee selection" using a quasi-experimental approach that exploits the timing and county specific implementation of Medicaid managed care mandates in Kentucky in the late 1990s. The Medicaid program in Kentucky was changed from a FFS system to a managed care system in two geographically distinct sub-sets of counties, so we compare recipients initially in each of the two sets of

"treatment" counties before and after this reform with recipients initially in neighboring "control" counties that remained in a FFS system in order to assess the impact of Medicaid managed care on child health care utilization (i.e., changes along the intensive margin).

Along the intensive margin, we find that both managed care plans decreased outpatient utilization among the children in our sample, though the Louisville-centered Passport plan was able to do so to a greater degree. In addition, both programs appear to have had a minimal impact on inpatient utilization for children. A key difference between the effects of the two programs is that the Passport plan reduced physician utilization among children, while in the Lexington-centered KHS plan physician utilization actually increased by a modest amount. Therefore, the heterogeneous treatments generated by differences in plan design between the two regions led to different outcomes with respect to utilization. While Passport capitated reimbursement for physicians and outsourced important administrative functions to an experienced firm, the KHS plan handled such administrative functions internally and reimbursed physicians on a FFS basis. Our findings, based on roughly a year and a half of post-reform data, foreshadow the eventual failure of the KHS plan. Along the extensive margin, we see some evidence of movement of children out of formal Medicaid coverage and into no coverage. Finally, we find suggestive evidence that the reductions in utilization observed in Passport did not lead to adverse health outcomes for asthmatic children, as measured by inpatient hospitalizations.

Our results should be of interest to policymakers considering Medicaid managed care as a cost-containment measure, given the current financial difficulties facing many states and the looming challenge of Medicaid expansion under the Affordable Care Act (ACA). In fact, Kentucky is expanding managed care as one way of addressing its current Medicaid budget

problems.[27] In addition, Florida recently approved a massive overhaul of its Medicaid system, which will shift hundreds of thousands of Medicaid recipients into HMOs. Plan sponsor, Representative Rob Schenck (R-Spring Hill, FL), said "We get to save billions of dollars, and we get to deliver better health care."[28] Our analysis suggests that up front plan design decisions, such as the choice of reimbursement mechanism for physicians, may in large part determine the eventual success or failure of any expansions of managed care.

[27] See http://chfs.ky.gov/news/Medicaid+RFP11.htm for more details.
[28] See http://www.kaiserhealthnews.org/Stories/2011/May/08/Florida-Legislature-Passes-Massive-Medicaid-Overhaul.aspx

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Table 1
Trends in Kentucky Population and Medicaid Enrollment (in thousands)

| Year | Statewide Population | Region 3 Population | Region 5 Population | Statewide Medicaid Enrollment | Region 3 Medicaid Enrollment | Region 5 Medicaid Enrollment | Statewide Medicaid Managed Care | Statewide Medicaid FFS |
|---|---|---|---|---|---|---|---|---|
| 1997 | 3,953 | 1,093 | 719 | 532 | 112 | 75 | 0 | 532 |
| 1998 | 3,985 | 1,102 | 730 | 521 | 109 | 73 | 181 | 340 |
| 1999 | 4,018 | 1,114 | 742 | 518 | 106 | 71 | 177 | 341 |
| 2000 | 4,049 | 1,125 | 810 | 557 | 114 | 79 | 114 | 443 |
| 2001 | 4,066 | 1,132 | 801 | 608 | 126 | 88 | 126 | 482 |
| 2002 | 4,087 | 1,139 | 790 | 627 | 131 | 91 | 131 | 496 |

Sources: Population estimates are from the Kentucky State Data Center (http://ksdc.louisville.edu/ ) and the Medicaid eligible estimates are from the Kentucky Cabinet for Health and Family Services (http://chfs.ky.gov/dms/stats.htm). Passport was implemented in Region 3 from 1998 onward. Kentucky Health Select was implemented in Region 5 during 1998-1999.

Table 2
Passport and Kentucky Health Select Monthly Capitation Rates (in dollars)

| | Passport | | |
|---|---|---|---|
| Eligibility Category | Prior to November 1997 | November 1997 to June 1998 | July 1998 to December 1998 |
| AFDC/TANF | N/A | 137.00 | 146.20 |
| Foster Care | N/A | 177.38 | 188.52 |
| SOBRA | N/A | 171.02 | 181.85 |
| SSI with Medicare | N/A | 117.00 | 125.24 |
| SSI without Medicare | N/A | 504.65 | 531.51 |
| SCHIP | N/A | N/A | N/A |

| | Kentucky Health Select | | |
|---|---|---|---|
| Eligibility Category | Prior to November 1997 | November 1997 to June 1998 | July 1998 to December 1998 |
| AFDC/TANF | N/A | 124.18 | 150.39 |
| Foster Care | N/A | 166.26 | 194.52 |
| SOBRA | N/A | 160.28 | 188.67 |
| SSI with Medicare | N/A | 143.03 | 170.16 |
| SSI without Medicare | N/A | 382.39 | 421.14 |
| SCHIP | N/A | N/A | N/A |

Source: Adopted from Bartosch and Haber (2004)

Table 3
Regional Comparisons using the Census

| | Region 1 | Region 2 | Region 3 (Passport) | Region 4 | Region 5 (KHS) | Region 6 | Region 7 | Region 8 |
|---|---|---|---|---|---|---|---|---|
| Total Population, 2006 | 235 | 382 | 1,177 | 472 | 799 | 400 | 250 | 491 |
| Average County Population | 20 | 32 | 74 | 24 | 38 | 67 | 18 | 26 |
| White (%) | 90.5 | 88.0 | 80.7 | 92.5 | 86.9 | 93.0 | 96.0 | 96.9 |
| Living In Same House, 1995 and 2000 (%) | 59.5 | 56.0 | 54.0 | 56.9 | 48.8 | 53.9 | 61.7 | 66.6 |
| High School Graduates In 2000 (%) | 75.8 | 74.9 | 80.0 | 66.8 | 77.7 | 81.4 | 68.1 | 58.7 |
| Homeownership In 2000 (%) | 75.0 | 71.2 | 69.9 | 73.9 | 64.9 | 70.3 | 77.0 | 76.1 |
| Poverty Rate In 2004 (%) | 15.6 | 15.8 | 13.7 | 18.9 | 14.7 | 10.6 | 20.0 | 26.3 |
| Kentucky Counties in Region | Ballard, Caldwell, Calloway, Carlisle, Crittenden, Fulton, Graves, Hickman, Livingston, Lyon, Marshall, McCracken | Christian, Daviess, Hancock, Henderson, Hopkins, McLean, Muhlenberg, Ohio, Todd, Trigg, Union, Webster | Breckinridge, Bullitt, Carroll, Grayson, Hardin, Henry, Jefferson, Larue, Marion, Meade, Nelson, Oldham, Shelby, Spencer, Trimble, Washington | Adair, Allen, Barren, Butler, Casey, Clinton, Cumberland, Edmonson, Green, Hart, Logan, McCreary, Metcalfe, Monroe, Pulaski, Russell, Simpson, Taylor, Warren, Wayne | Anderson, Bourbon, Boyle, Clark, Estill, Fayette, Franklin, Garrard, Harrison, Jackson, Jessamine, Lincoln, Madison, Mercer, Montgomery, Nicholas, Owen, Powell, Rockcastle, Scott, Woodford | Boone, Campbell, Gallatin, Grant, Kenton, Pendleton | Bath, Boyd, Bracken, Carter, Elliott, Fleming, Greenup, Lawrence, Lewis, Mason, Menifee, Morgan, Robertson, Rowan | Bell, Breathitt, Clay, Floyd, Harlan, Johnson, Knott, Knox Laurel, Lee, Leslie, Letcher, Magoffin, Martin, Owsley, Perry, Pike, Whitley, Wolfe |

Notes: Population measured in thousands. Source of data is U.S. Census QuickFacts data for Kentucky: http://quickfacts.census.gov/qfd/states/21000.html

Table 4
Final Study County Comparisons using the Census

| | Passport Treatment | Passport Control | KHS Treatment | KHS Control | Passport Counties (Shared Border) | KHS Counties (Shared Border) |
|---|---|---|---|---|---|---|
| Total Population, 2006 | 77 | 112 | 147 | 253 | 126 | 119 |
| Average County Population | 19 | 16 | 16 | 18 | 25 | 30 |
| White (%) | 93.9 | 95.0 | 96.5 | 96.3 | 89.3 | 89.0 |
| Living In Same House, 1995 and 2000 (%) | 60.7 | 62.1 | 58.2 | 59.6 | 54.2 | 53.0 |
| High School Graduates in 2000 (%) | 67.7 | 64.6 | 63.7 | 63.4 | 76.9 | 78.0 |
| Homeownership In 2000 (%) | 79.1 | 78.5 | 75.5 | 76.6 | 77.1 | 70.3 |
| Poverty Rate In 2004 (%) | 16.7 | 17.8 | 19.0 | 20.6 | 12.1 | 12.7 |
| Counties | Breckinridge, Grayson, Larue, Marion | Butler, Edmonson, Green, Hart, Hancock, Ohio, Taylor | Estill, Harrison, Jackson, Lincoln, Montgomery, Nicholas, Owen, Powell, Rockcastle | Bath, Bracken, Clay, Fleming, Gallatin, Grant, Laurel, Lee, Menifee, Owsley, Pendleton, Pulaski, Robertson, Wolfe | Henry, Nelson, Shelby, Spencer, Washington | Anderson, Boyle, Franklin, Mercer |

Notes: Population measured in thousands. Source of data is U.S. Census QuickFacts data for Kentucky: http://quickfacts.census.gov/qfd/states/21000.html

Table 5
Summary Statistics using Kentucky Administrative Data

| | Children Initially in a Passport County | Children Initially in a Passport Control County | Children initially in a KHS County | Children initially in a KHS Control County |
|---|---|---|---|---|
| # children | 1,890 | 2,816 | 4,273 | 9,317 |
| # child months (30 months total) | 56,700 | 84,480 | 128,190 | 279,510 |
| % of children that switched county | 23.9 | 26.0 | 25.2*** | 20.6 |
| *Demographics:* | | | | |
| Age on Jan 1, 1996 | 7.1* | 6.8 | 7.2 | 7.1 |
| % non-white | 11.1 | 9.7 | 6.5 | 5.9 |
| % female | 48.9** | 45.6 | 46.7 | 47.5 |
| Number of siblings | 0.8 | 0.8 | 0.8 | 0.8 |
| *Utilization:* | | | | |
| Percentage with any monthly Medicaid: | | | | |
| Outpatient Utilization Jan 97- Oct 97, Prior to Medicaid Managed Care | 9.8%*** | 8.6% | 10.4%*** | 9.5% |
| Outpatient Utilization Nov 97- June 99 After Medicaid Managed Care | 5.2%*** | 8.0% | 8.2%*** | 9.0% |
| Professional Utilization Jan 97- Oct 97 Prior to Medicaid Managed Care | 37.6%*** | 35.1% | 32.2%*** | 36.1% |
| Professional Utilization Nov 97- June 99 After Medicaid Managed Care | 24.8%*** | 34.3% | 32.5%*** | 35.6% |
| Inpatient Utilization Jan 97- Oct 97 Prior to Medicaid Managed Care | 0.5% | 0.6% | 0.4%*** | 0.5% |
| Inpatient Utilization Nov 97- June 99 After Medicaid Managed Care | 0.3%*** | 0.4% | 0.3%*** | 0.4% |

Source: De-identified, linked Medicaid claims and enrollment data provided by the Kentucky Cabinet for Health and Family Services. Notes: The stars represent the results of tests for difference in means or proportions between the treatment and control counties within each region. Three stars, two stars, and one star imply statistically significant differences at the 1%, 5% and 10% levels, respectively.

Table 6
Effects of HMO Enrollment on Health Care Utilization

| | Any Professional Visits? | | Any Outpatient Visits? | | Any Inpatient Visits? | |
|---|---|---|---|---|---|---|
| | OLS (1a) | IV (1b) | OLS (2a) | IV (2b) | OLS (3a) | IV (3b) |
| **Passport** | | | | | | |
| HMO Enrollment | -0.160*** | -0.170*** | -0.060*** | -0.060*** | -0.0010* | -0.0010 |
| | (0.004) | (0.007) | (0.003) | (0.004) | (0.0004) | (0.0010) |
| 30 Month-Year Dummies? | Yes | Yes | Yes | Yes | Yes | Yes |
| Child Fixed Effects? | Yes | Yes | Yes | Yes | Yes | Yes |
| *Pre-Reform Avg. Monthly Utilization Rate:* | 36% | 36% | 9% | 9% | 0.6% | 0.6% |
| *Percent Change:* | *-44%* | *-47%* | *-66%* | *-66%* | *-18%* | *-18%* |
| **KHS** | | | | | | |
| HMO Enrollment | 0.021*** | 0.012*** | -0.016*** | -0.021*** | 0.0010* | 0.0010 |
| | (0.003) | (0.004) | (0.002) | (0.002) | (0.0004) | (0.0010) |
| 30 Month-Year Dummies? | Yes | Yes | Yes | Yes | Yes | Yes |
| Child Fixed Effects? | Yes | Yes | Yes | Yes | Yes | Yes |
| *Pre-Reform Avg. Monthly Utilization Rate:* | 35% | 35% | 10% | 10% | 0.5% | 0.5% |
| *Percent Change:* | *6%* | *3%* | *-16%* | *-21%* | *20%* | *20%* |

Source: De-identified, linked Medicaid claims and enrollment data provided by the Kentucky Cabinet for Health and Family Services. Notes: These regressions also include monthly controls for child age. Standard errors are in parentheses. Passport regressions include 4,706 children followed for 30 months, while the KHS regressions include 13,590 children followed for 30 months. Three stars, two stars, and one star imply statistically significant parameter estimates at the 1%, 5% and 10% levels, respectively.

Table 7
Extensive Margin: Impact of Medicaid Managed Care Eligibility on Health Insurance Coverage

| | (1) | (2) | (3) |
|---|---|---|---|
| | | Medicaid coverage | |
| Eligible for Medicaid Managed Care | -0.105*** | -0.164*** | -0.131** |
| | (0.030) | (0.041) | (0.054) |
| $R^2$ | 0.276 | 0.278 | 0.307 |
| | | Private coverage | |
| Eligible for Medicaid Managed Care | -0.059* | -0.129*** | -0.145** |
| | (0.032) | (0.044) | (0.058) |
| $R^2$ | 0.358 | 0.359 | 0.360 |
| | | Uninsured | |
| Eligible for Medicaid Managed Care | 0.103*** | 0.162*** | 0.191*** |
| | (0.027) | (0.037) | (0.052) |
| $R^2$ | 0.067 | 0.069 | 0.058 |
| CPS analytic weights included? | Yes | Yes | Yes |
| Region*Year Trends? | No | Yes | Yes |
| Exclude Imputes? | No | No | Yes |
| # children | 3,839 | 3,839 | 2,420 |

Source: Models estimated from March 1997-2003 Current Population Survey data. Notes: Final column is preferred CPS specification. Models include dummies for child's sex, race (white/black/other), dummies for households poverty status (0-100, 100-200, 200-300, 300+), homeownership, region dummies (regions 3, 5, and 7), year dummies (1997-2002), child's age entered linearly, and a constant term. Eligible for Medicaid managed care is the percentage of children who would be eligible based solely on region and year.

Table 8
Impact of Medicaid Managed Care by Income Group

| | (1) | (2) | (3) |
|---|---|---|---|
| | | Medicaid coverage | |
| Eligible for Medicaid Managed Care | -0.344*** | 0.029 | -0.012 |
| | (0.106) | (0.042) | (0.063) |
| Eligible*Under 200% FPL | --- | --- | -0.266*** |
| | | | (0.078) |
| $R^2$ | 0.276 | 0.278 | 0.317 |
| | | Private coverage | |
| Eligible for Medicaid Managed Care | -0.200** | -0.102 | -0.149** |
| | (0.091) | (0.076) | (0.069) |
| Eligible*Under 200% FPL | --- | --- | -0.002 |
| | | | (0.085) |
| $R^2$ | 0.358 | 0.359 | 0.360 |
| | | Uninsured | |
| Eligible for Medicaid Managed Care | 0.375*** | 0.055 | 0.182*** |
| | (0.090) | (0.058) | (0.042) |
| Eligible*Under 200% FPL | --- | --- | 0.291*** |
| | | | (0.064) |
| $R^2$ | 0.067 | 0.069 | 0.070 |
| Income Group | Under 200% of FPL | Over 200% of FPL | Full sample |
| CPS analytic weights included? | Yes | Yes | Yes |
| Region*Year Trends? | Yes | Yes | Yes |
| Exclude Imputed Values? | Yes | Yes | Yes |
| # children | 1,191 | 1,229 | 2,420 |

Source: Models estimated from March 1997-2003 Current Population Survey data. Notes: Models include dummies for child's sex, race (white/black/other), dummies for households poverty status (0-100, 100-200, 200-300, 300+), homeownership, region dummies (regions 3, 5, and 7), year dummies (1997-2002), child's age entered linearly, and a constant term. Eligible for Medicaid managed care is the percentage of children who would be eligible for Medicaid managed care. The final column (the DDD specification) includes interactions of poverty level and Eligible for Medicaid Managed Care, poverty level and year, and poverty level and region.

Table 9
IV Estimates of the Impact of Passport Managed Care on Asthmatic Children and All Other Children

| | (1) Original Treatment and Control Counties | | (2) All Passport Counties versus Region 4 Counties | | (3) All Passport Counties versus Region 2 and 4 Counties | |
|---|---|---|---|---|---|---|
| | Asthmatic Children | All Other Children | Asthmatic Children | All Other Children | Asthmatic Children | All Other Children |
| Any Professional Visits? | -0.270*** | -0.170*** | -0.130*** | -0.070*** | -0.140*** | -0.070*** |
| | (0.029) | (0.007) | (0.009) | (0.002) | (0.008) | (0.002) |
| Baseline Rate | 57% | 35% | 54% | 29% | 55% | 30% |
| Percent Change | -47% | -20% | -24% | -24% | -26% | -23% |
| Any Outpatient Visits? | -0.100*** | -0.060*** | -0.060*** | -0.040*** | -0.060*** | -0.040*** |
| | (0.021) | (0.004) | (0.006) | (0.001) | (0.006) | (0.001) |
| Baseline Rate | 18% | 8% | 17% | 7% | 16% | 7% |
| Percent Change | -58% | -71% | -36% | -55% | -36% | -55% |
| Any Inpatient Visits? | 0.0100 | -0.0030*** | -0.0030 | -0.0010*** | -0.0010 | -0.0010*** |
| | (0.0080) | (0.0010) | (0.0030) | (0.0003) | (0.0020) | (0.0003) |
| Baseline Rate | 3.0% | 0.4% | 2.8% | 0.4% | 2.8% | 0.4% |
| Percent Change | 33% | -77% | -11% | -24% | -4% | -24% |

Source: De-identified, linked Medicaid claims and enrollment data provided by the Kentucky Cabinet for Health and Family Services. Notes: The regressions in this table estimate similar models to those in Table 6. The first set of results divides the sample of 4,706 children into asthmatic children (N=327), and all others (N=4,379). The second set of results – with a larger geographic coverage – examines 2,042 asthmatic children compared to 31,290 other children. The final set of results examines 2,465 asthmatic children compared to 38,822 other children. Three stars, two stars, and one star imply statistically significant parameter estimates at the 1%, 5% and 10% levels, respectively.

Table 10
Specification Checks

| | Any Professional Visits? | Any Outpatient Visits? | Any Inpatient Visits? |
|---|---|---|---|
| HMO Enrollment in Passport | -0.170*** | -0.060*** | -0.0010 |
| | (0.007) | (0.004) | (0.0010) |
| HMO Enrollment in KHS | 0.012*** | -0.021*** | 0.0010 |
| | (0.004) | (0.002) | (0.0010) |
| HMO Enrollment – Combined Regions | -0.040*** | -0.032*** | 0.0001 |
| | (0.003) | (0.002) | (0.0005) |
| HMO Enrollment – All 120 Counties, Combined Regions | -0.051*** | -0.027*** | 0.0004* |
| | (0.001) | (0.001) | (0.000) |

Source: De-identified, linked Medicaid claims and enrollment data provided by the Kentucky Cabinet for Health and Family Services. Notes: All models estimated using our IV specification. The results for Passport and KHS are for the specification in Table 6. There are 4,706 observations for the Passport specification, 13,590 for the KHS specification, 18,296 for the Combined Regions specification, and 101,649 for the All Counties, Combined Regions specification. Three stars, two stars, and one star imply statistically significant parameter estimates at the 1%, 5% and 10% levels, respectively.

Table 11
IV Analysis of Heavy Health Care Users

| | Indicator for expenditure of $50 or more on professional visits during month | Indicator for expenditure of $100 or more on outpatient visits during month |
|---|---|---|
| HMO | -0.070*** | -0.020*** |
| | (0.006) | (0.002) |
| 30 Month-Year Dummies? | Yes | Yes |
| Child Fixed Effects? | Yes | Yes |
| *Pre-Reform Avg. Monthly Utilization Rate:* | 18.7% | 4.7% |
| *Percent Change:* | *-37%* | *-94%* |

Source: De-identified, linked Medicaid claims and enrollment data provided by the Kentucky Cabinet for Health and Family Services. Notes: Sample includes all 4,706 children from the Passport sample, for all 30 months. Three stars, two stars, and one star imply statistically significant parameter estimates at the 1%, 5% and 10% levels, respectively.

Appendix Table 1
Services Covered by the State Capitation Payments to the Plans

| Capitated Services | | Excluded Services |
|---|---|---|
| Inpatient Hospital Services | Dental Services | Mental Hospitals |
| Outpatient Hospital Services | Medical Transportation | Psychiatrists |
| Urgent and Emergency Services | EPSDT Services | Psychiatric Beds (Inpatient Hospital) |
| Outpatient Surgical Services | Vision Care | Non-Emergency Transportation (Mental Health) |
| Medical services provided by: | Preventive Health Services provided by: | AIS/MR Services |
| • Physicians | • Public Health Departments | ICF/MR |
| • Advanced Practice RNs | • FQHCs | Targeted Case Management (Behavioral Health) |
| • Physician Assistants | • Rural Health Centers | Home and Community-Based Waiver Services |
| • FQHCs | Hearing Services (under age 21) | Certain Medicare-Only Services: |
| • Primary Care Centers | Durable Medical Equipment | • CORF Services |
| • Rural Health Clinics | Alternative Birthing Services | • Chiropractors |
| Laboratory | Podiatry Services | • Physicians Assistant |
| X-rays | Family Planning Clinic Services | • Physical and Occupational Therapy |
| Appropriate Escort Meals and Lodging | Renal Dialysis | • Psychologist |
| Therapeutic Evaluation and Treatment: | Hospice Services | • Clinical Social Worker |
| • Physical Therapy | Organ Transplant Services | Nursing Facility Services |
| • Speech Therapy | Specialized Case Management for Children and Adults with Complex Conditions | EPSDT Special Services (Behavioral Health) |
| • Occupational Therapy | Behavioral Health (Limited to PCP) | School-Based Services for Disabled Students |
| Home Health Services | Medical Detoxification | Early Intervention Services for Infants and Toddlers with Disabilities |
| Pharmacy and Limited OTC Drugs | | |

Source: Bartosch and Haber (2004)

Append Table 2
First Stage Regression Results of Monthly HMO Enrollment on HMO Eligibility

| | Passport Program | KHS Program |
|---|---|---|
| Child is Eligible For Managed Care (Based On Initial County of Residence and Time Period) | 0.690*** (0.002) | 0.790*** (0.001) |
| 30 Month-Year Dummies? | Yes | Yes |
| Child Fixed Effects? | Yes | Yes |
| $R^2$ | 0.69 | 0.75 |
| # children | 4,706 | 13,590 |
| # child - months | 141,180 | 407,700 |

Source: De-identified, linked Medicaid claims and enrollment data provided by the Kentucky Cabinet for Health and Family Services.
Notes: These regressions also include monthly controls for child age. Standard errors are given in parenthesis. Three stars, two stars, and one star imply statistically significant parameter estimates at the 1%, 5% and 10% levels, respectively.

**Figure 1 – Kentucky's 8 Regions, Including Passport Counties (Region 3) and Kentucky Health Select (Region 5)**

**Figure 2 – The Final Study Counties**

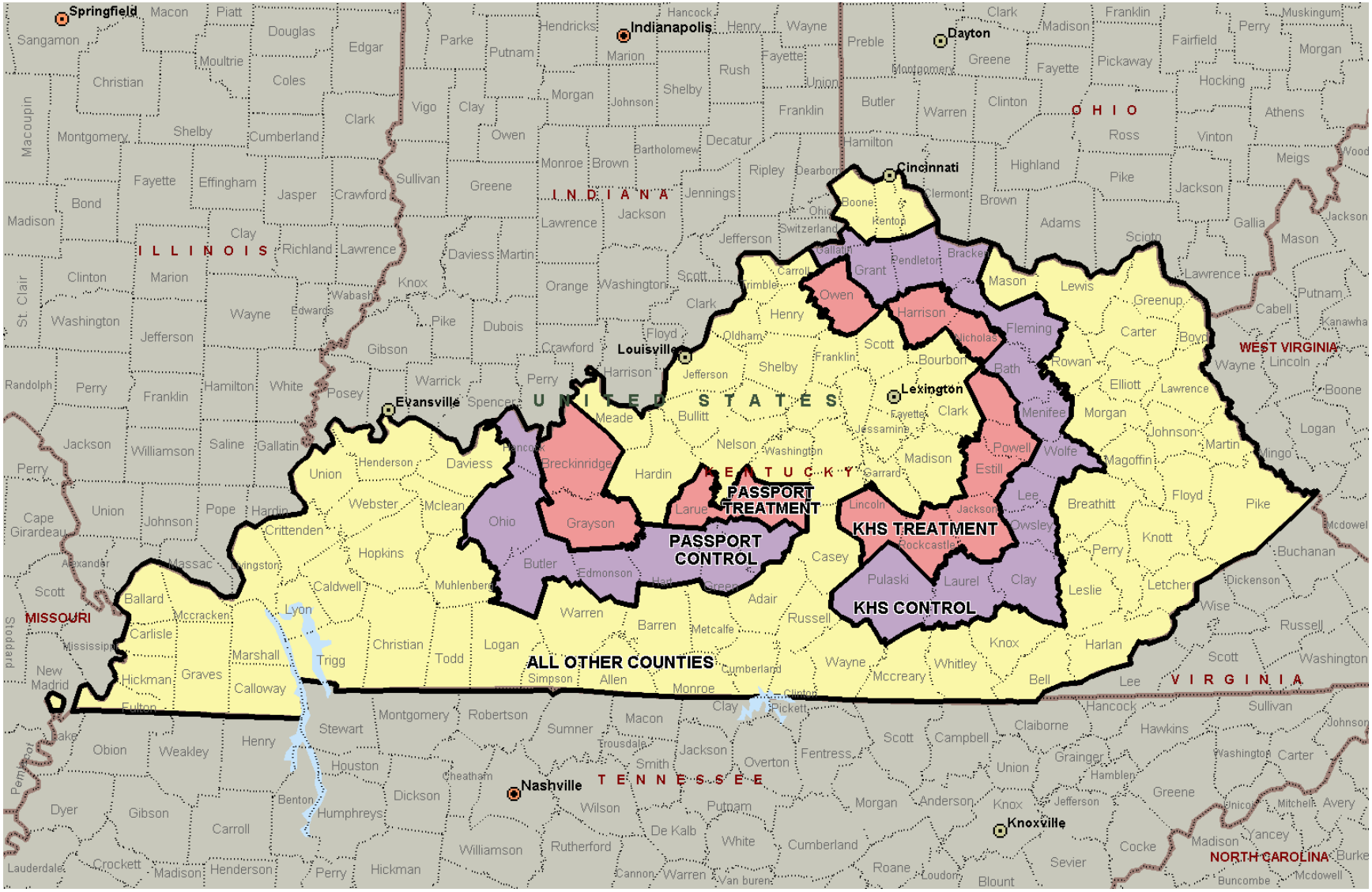
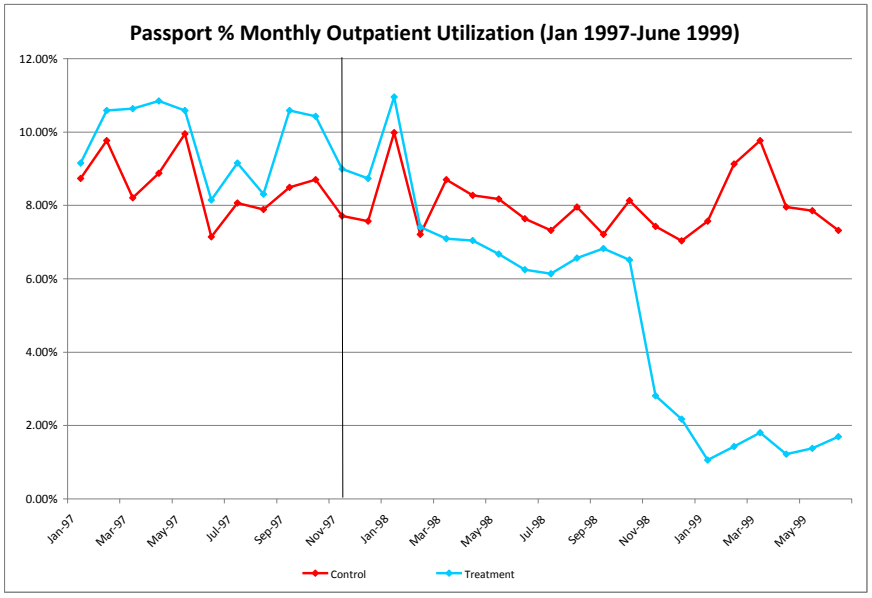
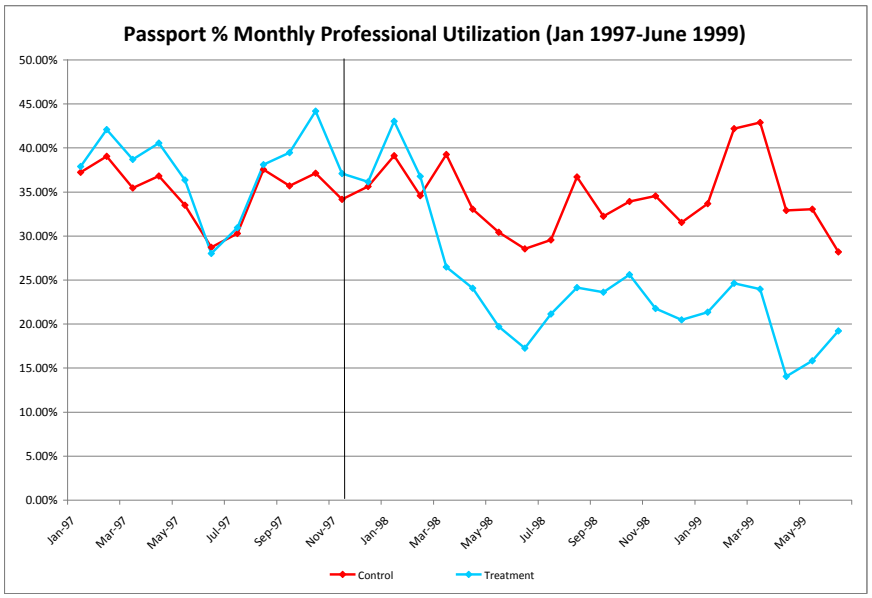


Figure 3
Child Healthcare Utilization Before and After Passport



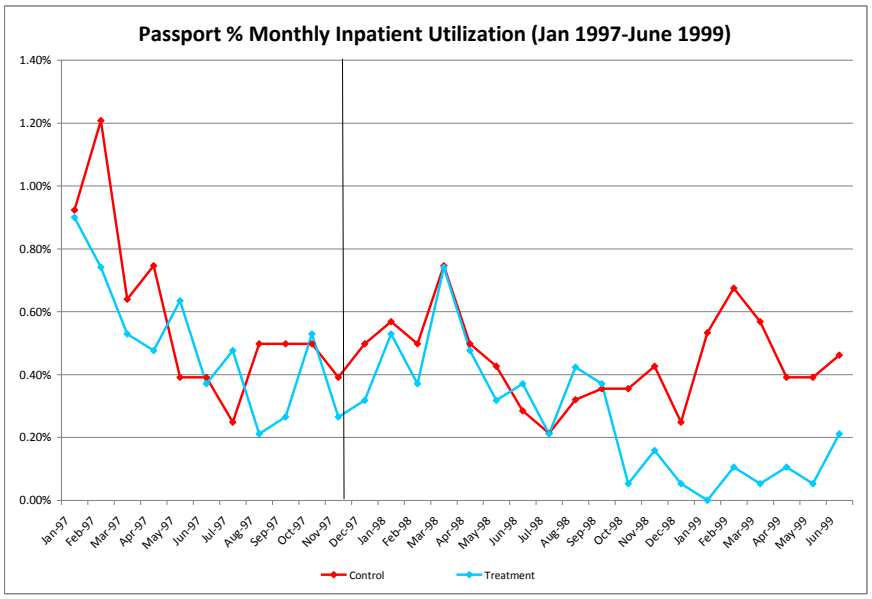
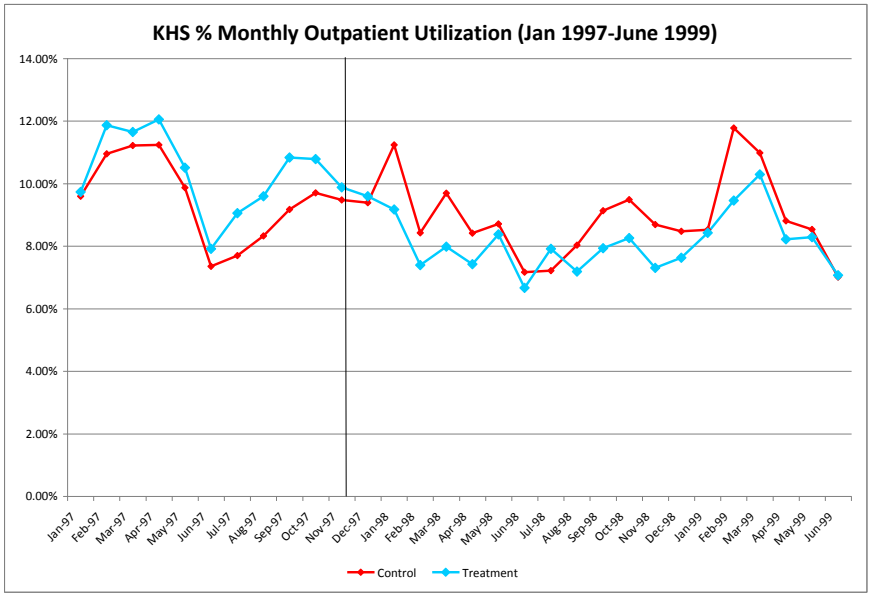
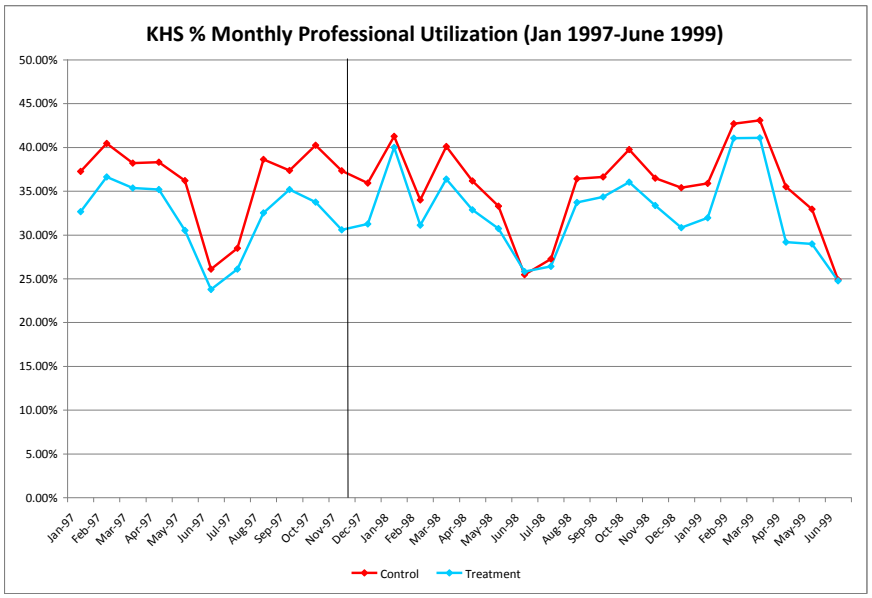



Figure 4
Child Healthcare Utilization Before and After KHS



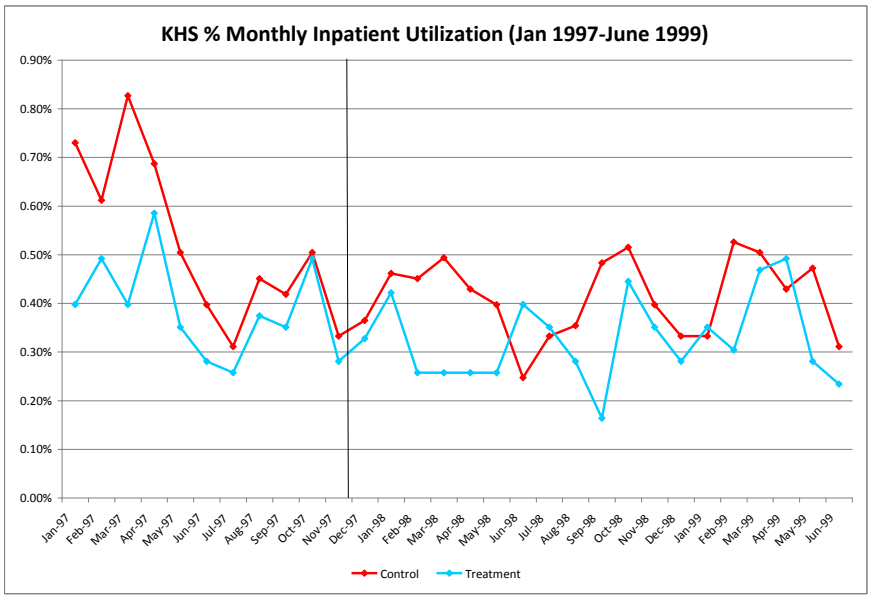
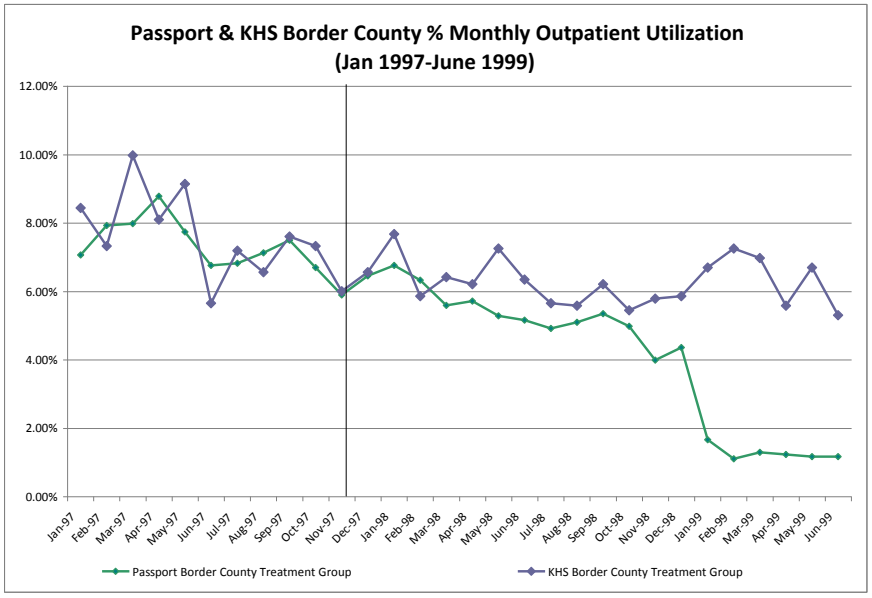
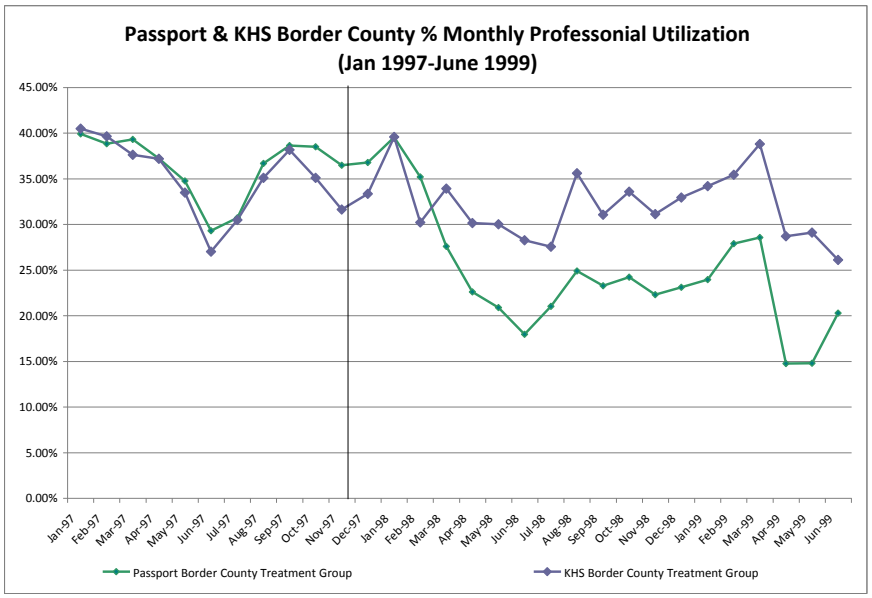



Figure 5
Healthcare Utilization In Bordering Passport and KHS Counties



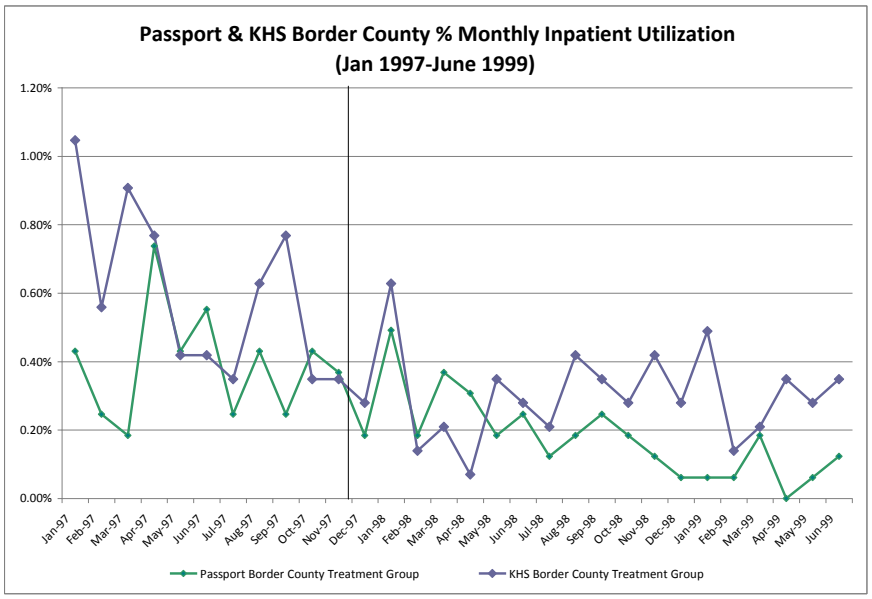



Figure 6
Monthly Count of Unique Medicaid Provider Identifiers in Passport (Treatment) and non-Passport (Control) Counties