Analysis of the Potential Cost Savings in Medicaid for Mental Health Services in Virginia

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Abstract

We estimate the effects of various factors on service provision and unit cost by public mental health providers using administrative data from Virginia and find that, while there is significant variation in service provision levels and unit costs across providers, it is difficult to explain much of the variation. Especially with respect to cost results, this suggests some potential for cost savings but also a need for better data on cost determinants. We also use MEPS data to show that individuals with Medicaid health insurance use more mental health services than those with private insurance but at significantly lower unit costs. We suggest reasons why this might occur and what those reasons imply about methods to reduce Medicaid expenditures in Virginia and other states.

1 Introduction

Health care costs have been rising at a steady rate for decades and are projected to continue rising into the foreseeable future. Figure 1 shows third party payment expenditures growing from approximately $1.0 trillion in 2000 to $3.7 trillion in 2020, a 6.8% annual growth rate (NHE, 2012). Figure 2 shows growth for Medicaid from $200 billion in 2000 to $1 trillion in 2020, a 8.4% annual growth rate (NHE, 2012). As seen in Figure 2, projected growth rates for Medicare are about the same. As seen in Figure 3 (source: SAMHSA, 2012), expenditures for mental health care also are growing rapidly, although, unlike total health

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expenditures, both the level and growth rate of Medicaid funding are on par with private insurance.

For Medicaid, a significant portion of the cost is borne by states, and Medicaid expenditures represent a large and growing portion of state budgets. Figure 4 shows the distribution of the proportion of state spending on Medicaid. For example, the median state spent 13.1% of its budget on Medicaid in FY2010 (Kaiser Family Foundation, 2012a). Virginia spent 17.3%, more than 75% of other states. Using state-specific projected growth rates from Kaiser Family Foundation (2012a) and assuming no other components of state government
spending increase, the distribution of proportions in FY2020 will move significantly to the right, and Virginia’s proportion will increase to 22.7%.

States are looking for ways to slow down or stop growth. Virginia has made serious efforts to reduce state Medicaid cost by proposing a central managed care/care coordination contract for the state. The contract would include primary care as well as behavioral health. The enabling Virginia legislation lists as a goal to “improve the value of behavioral health services purchased by the Commonwealth of Virginia without compromising access to behavioral health services for vulnerable populations” (Virginia DMAS, 2011, page 30). The RFP issued by the Commonwealth of Virginia Department of Medical Assistance Services dated December 16, 2011 does not explicitly outline reducing Medicaid cost as an objective but does require “cost savings through decreasing avoidable episodes of care and hospitalizations, strengthening the discharge planning process, improving adherence to medication regimens, and utilizing community alternatives to hospitalizations and institutionalization” (Virginia DMAS, 2011, page 31), along with other, less concrete, cost-savings requirements. In general, managed care initiatives usually define service limits as a means of reducing potential waste and forcing providers to create efficient service delivery plans for consumers; also, they reduce reimbursement rates on high cost services to minimize the use of such services. Presently, Virginia has

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1Mark et al. (2011) review trends in public spending on mental health and issues that might affect mental health provision in the near future.

2There is mixed evidence on the effect of using managed care to provide mental health services (see McFarland (2000) for an early review). For example, Cole et al. (1994), Reed et al. (1994), and Reed and Babigian (1994) find that use of managed care has no significant effect based on an experiment in Rochester, NY. Also, Callahan et al. (1995), Dickey et al. (1996, 1998), Frank, et al. (1996), Frank and McGuire (1997), and Mello, Stearns, and Norton (2002) find that managed care lowers state Medicaid expenses with no significant effect on quality of care. However, Gurmu (1997) and Santos Silva and Windmeijer (2001) find mixed effects of managed care, Cutler, McFarland, and Winthrop (1998) and Geller et al. (1998) raise some concerns about the quality of care under managed care, Goldman et al. (2002) find evidence of managed care provision increasing costs, and Tang et al. (2008) find evidence of managed care increasing the level of unmet need.
59.2% of Medicaid eligibles going through managed care, while 82.4% of other states have higher proportions, and the median is 75% (Kaiser Family Foundation, 2012b). Based on NASMHPD Research Institute (2012), in 2012, 31 states had managed care systems for Medicaid mental health services, and 12 did not. The median predicted growth rate of expenditures was 2.87% among the 31 with managed care systems, and it was 3.80% among the 12 with no managed care systems (Kaiser Family Foundation, 2012b).

One component of Medicaid expenditures is for mental health services. Mark et al. (2003) reports that between 9% and 13% of all Medicaid dollars are spent on mental health services. Kessler et al. (2001) estimates that more than 25% of U.S. adults had a mental illness in the previous year. The societal costs associated with mental illness are large (see, for example, Greenberg et. al, 1993; Kouzis and Eaton, 1994; Kessler and Frank, 1997; Berndt et. al, 1998, Baldwin, 1999; Kessler et. al, 1999; Marcotte, Wilcox-Gok, and Redmon, 2000; Alexandre and French, 2001; Greenberg et. al, 2003; Chatterji et. al, 2005; Frank and Gertler, 2007; McKeithen and Stern, 2007).

There are three margins available for reducing Medicaid expenditure: a) reduce the number of people eligible for Medicaid, b) reduce per capita service provision for those eligible, and/or c) reduce unit cost. Because of the Affordable Care Act, the number of people in Virginia eligible for Medicaid is expected to increase by 561000 people (Cable, 2010). Thus, (a) is not going to happen. In fact, Figure 5 shows the distribution of growth across states in Medicaid eligibility, state spending due to the ACA, and federal spending due to the ACA. The median eligibility growth rate is 32.4%, and the median growth rate in state spending is 1.7%; these compare to growth rates for Virginia of 51.2% and 3.7% respectively (Kaiser Family Foundation, 2012c). Given the goals of managed care reported above, it is clear that Virginia plans to rely on (b) and (c).

In this paper, we focus on the service provision margin and the unit cost

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3There were no reported results for California, Georgia, Illinois, Iowa, Missouri, Rhode Island, and South Dakota.
margin. In Virginia, there has been a strong move toward privatization. The motivation for this move is to decrease the provision of community mental health care, resulting in cost savings to the rising state Medicaid budget. We examine cost and service data from Virginia. Virginia provides mental health services through 40 local community service boards (CSBs). Some CSBs have service areas corresponding to a single governmental jurisdiction, either a city or county, and others are multi-jurisdictional. Those CSBs corresponding to a single governmental jurisdiction function as any other department of that governmental system (i.e., Social Services, police, and fire departments). Staff compensation decisions are made by those jurisdictions for all local departments including CSBs. In the case of multi-jurisdictional CSBs, they submit annual budget proposals for personnel and operating expenses to local governments along with all other local agencies operating outside the internal funding system. The free rider problem associated with multi-jurisdictional CSBs often results in minimal funding of personnel cost, which is the largest cost of operating CSBs. The largest CSB in Virginia is Fairfax-Falls Church CSB with approximately 1.0 million people in its service area, and the smallest is Dickenson County Behavioral Health Services with approximately 16200 people in its service area. There are 19 states with systems similar to Virginia, including New York, North Carolina, and Pennsylvania. Thirty-eight states provide funding to community-based agencies (e.g., Georgia, Illinois, New Jersey), and 12 states provide services directly through the state government (e.g., Louisiana, New York, Ohio) (NASMHPD Research Institute, 2010).

The analysis of the Virginia state data provides no information about the effects of Medicaid provision on individuals. Hadley and Holahan (2003) find that privately insured individuals spend significantly more than Medicaid beneficiaries on medical care after controlling for demographics, health status, and income and show that the relevant variation is in prices. Ku and Broaddus (2008) find that out-of-pocket spending under private health insurance is much higher than that under Medicaid. They also discover that the difference in out-of-pocket spending contributes the most to the difference in total medical expenditure. Frees, Gao, and Rosenberg (2011) find that health insurance coverage has a significant positive effect on both the frequency and amount of health care expenditure. But they do not distinguish different types of health insurance. Finkelstein, et al. (2011) find, in a randomized sample in Oregon, that provision of Medicaid resulted in more medical care and better self-reported physical and mental health.4

A way to investigate the costs and benefits of Medicaid provision of mental health care benefits to individuals is to use a national data set with information on insurance provision and medical care usage. The Medical Expenditure Panel Survey (MEPS) is such a data set. Using MEPS, we can compare medical care costs and usage across people with different sources of medical insurance. Similar to both Hadley and Holahan (2003) and Ku and Broaddus (2008), we compare medical expenditure between privately insured individuals

4See, also, Mann and Artiga (2004) and McConnell et al. (2008).
and Medicaid beneficiaries. But we focus on unit health cost rather than total or out-of-pocket medical expenditure and use different models.

The structure of the rest of this paper is as follows: Section 2 presents evidence about variation in cost and service provision across CSBs in Virginia using state administrative data. Section 3 uses data from MEPS to measure the variation in cost and service provision across different types of medical care financing. Finally, Section 4 discusses implications of the empirical results in the earlier sections and concludes.

2 Variation in Cost and Service Across CSBs

2.1 Data and Estimation

The main data source we use to compare unit cost per service and number of units of service provided across 40 Community Service Boards (CSBs) comes from Virginia DBHDS (2010a). The state data include information about the funding structure for each CSB and record service characteristics for every service provided by each CSB. The Virginia Department of Behavioral Health and Developmental Services (DBHDS) requires each CSB, through the requirements outlined in an annual performance contract, to collect and submit monthly a defined data set of consumer information to include services received. In addition, CSBs are required to provide cost data for each core service provided by the CSB. It is the collection of these two sets of data that makes it possible for the department to generate state-wide disaggregated unit cost information for both internal needs and external reporting to the general assembly and Federal grantees.5

The data have 1000 observations where each observation provides information for a single service7 provided by one CSB.8 In the process of cleaning the data, we drop those observations that have missing data on capacity or number of units. Also, we exclude those services that have unreasonably high or low recorded unit cost. Table 1 lists the sample selection criteria. We use 860 observations in our estimation sample.

For each CSB, the data show the local, state government, federal government, and other sources of financial support. Across the state, 22.5% of funding

5White (2012) performs a similar analysis for physical health care.
6Beecham, Knapp, and Fenyo (1993) perform a cost analysis associated with community mental health provision using person-specific data. While we are very sympathetic to such an approach, we do not have the data to perform such an analysis.
7Kapur, Young, and Murata (2000) and Sallee and Agemy (2011) use a sample of individuals to estimate cost of care provision for an individual with particular observable characteristics to learn something about variation in agency cost caused by variation in the mix of clients across agencies. We do not have the data necessary to perform a similar analysis. However, neither study has anything to say about variation in cost due to factors other than client mix.
8It is possible for a CSB to have multiple records for the same service. The Combined CCS 3 Extract/CARS End of the Fiscal Year Report provides cost, units, and unit cost information for each Program Area (e.g., mental health, intellectual disability, substance abuse) and core service within program area. Multiple records occur for a particular core service when they are provided in multiple program areas (e.g., case management or supervised residential services.).
is from local sources, 24.0% of funding is from state sources, 5.6% is from Federal sources, and 44.6% from Medicaid and other fee-based funds (Virginia DBHDS, 2010b).

There are 23 different services included in the data, listed in Table 2. The core service categories were established to agree upon common language among CSBs in reporting service data to the DBHDS. The broad range of services are: (Virginia DBHDS, 2009).

- emergency services: unscheduled and sometimes scheduled crisis intervention, provided 24 hours per day and 7 days per week;
- inpatient services: services on a 24-hours-per-day basis in a hospital or training center;
- outpatient services: clinical treatment services, generally in sessions of less than 3 consecutive hours, to individuals and groups;
- case management services: services to assist individuals and their family members to access needed services that are responsive to the person’s individual needs;\(^9\)
- day treatment/support services: provision of structured programs of treatment, activity, or training services, generally in clusters of 2 or more continuous hours per day, to groups or individuals in non-residential settings;
- residential services: provision of overnight care with an intensive treatment or training program in a setting other than a hospital or training center, overnight care with supervised living, or other supportive residential services;
- prevention services: services designed to prevent mental health or substance use disorders or intellectual disability; and
- early intervention services: provision of family-centered, community-based early intervention services designed to meet the developmental needs of

\(^9\)Outpatient services and case management services are grouped together in Virginia DBHDS (2009).
infants and toddlers and their families as these needs relate to enhancing the child’s development.\(^{10}\)

Within these major categories are more detailed services typically ordered in terms of intensity. For example, motivational treatment services and medication assisted treatment are part of outpatient services; and rehabilitation, partial hospitalization, sheltered employment, and transitional or supported employment is part of day treatment.

The unit of the service (Beds, FTEs, and Slots) varies across services. For example, a residential house with room for 4 individuals has a static capacity of 4, measured in beds. To determine the expected/projected number of units of service available from this static capacity of 4 beds, one can multiply 4 beds times 365 days; thus the maximum number of bed days that can be generated from that residential site is 1460. Such a computation is helpful in measuring capacity utilization. For the purpose of defining capacity, living arrangements are measured in beds or “available beds” instead of FTEs because the FTEs necessary for a particular consumer’s needs is quite variable while the amount of physical capital (measured in the proxy, beds) is much less variable.

The same is true with services that are provided by the individual efforts of a single provider, such as a case manager or outpatient therapist. If one defines the expected number of work hours in a year as 2080 (40 hours times 52 weeks), then 2080 per FTE is the maximum number of service hours to be generated. This number is then discounted for considerations such as vacation time and holidays, and, because all work time is not necessarily time spent with or on behalf of a consumer (e.g., administrative meetings). This base number is further reduced to determine the expected number of service hours to be generated by a single provider, which provides the basis for productivity measurements and other measures of interest.

For services where there is significant variation in FTEs needed per client or there is significant fixed capital, then units of service are measured in slots.

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\(^{10}\)Prevention services and early intervention services are usually grouped together in Virginia DBHDS, 2009).
### Table 3: Moments of Explanatory Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(Unit Cost)</td>
<td>4.586</td>
<td>1.142</td>
</tr>
<tr>
<td>log(Units of Service)</td>
<td>8.345</td>
<td>2.027</td>
</tr>
<tr>
<td>log(Wage)</td>
<td>3.877</td>
<td>0.188</td>
</tr>
<tr>
<td>log(State Contribution)</td>
<td>8.507</td>
<td>0.628</td>
</tr>
<tr>
<td>log(Local Contribution/State Contribution)</td>
<td>-1.165</td>
<td>1.411</td>
</tr>
<tr>
<td>log(Capacity)</td>
<td>1.814</td>
<td>1.766</td>
</tr>
<tr>
<td>log(# People below Age 18)</td>
<td>9.526</td>
<td>1.134</td>
</tr>
<tr>
<td>log(# People above Age 65)</td>
<td>9.059</td>
<td>0.895</td>
</tr>
<tr>
<td>log(Average Distance to Nearest State Hospital)</td>
<td>10.577</td>
<td>0.783</td>
</tr>
</tbody>
</table>

Such variation in required FTEs may occur because of variation in the needs of the clients receiving the relevant service. The number of slots is the maximum number of individuals who could be served during a day or a half-day session in most day support programs. For example, in psychosocial rehabilitation programs, the number of slots is not the total number of members in the whole program; it is the number of members who can be served by the program at the same time during a session (Virginia DBHDS, 2009).

The data also provide information on the capacity of each service, the number of units of the service actually provided, and the total cost of providing the service. The cost measure we use in the analysis is log cost/unit of service. The standard deviation of log(unit cost) in Table 3 implies that there is significant variation in unit costs across CSBs. The same is true for units of service. The average unit cost\(^{11}\) is $98.10 (= \exp\{4.586\}) with a 4-standard deviation range of $9.99-$962.95. Group therapy is an example of a low-cost service, and PACT (and other multi-disciplinary programs) are examples of high cost services. The average number of units of service is 4209 with a 4-standard deviation range of 73 to 242559.\(^{12}\) Average capacity is 6.13 with a 4-standard deviation range is 0.18 to 209.8.\(^{13}\) An example of a low-capacity service is intensive service residential, and an example of a high-capacity service is early intervention services (because they frequently can be provided in a class or large meeting). The location of state psychiatric hospitals is shown in Figure 6. Average distance is 39.2 kilometers with a 4-standard deviation range of 8.2 to 187.8 kilometers.

One of the potential causes of variation in unit costs is variation in labor cost. Unfortunately, there is no measure of labor cost specific to the provision of either a specific mental health service or the “average” mental health service. We proxy for labor cost by using data from the Integrated Public Use Microdata Series-USA (IPUMS) on community-specific wage rates for occupations likely

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\(^{11}\)More precisely, we mean the exponent of the average log variable in the discussion of Table 3.

\(^{12}\)The largest units of service, for the Richmond CSB for day treatment/partial hospitalization, is 508195.

\(^{13}\)Rapahannock/Rapidan CSB has, for consumer monitoring service, a capacity of 0.01. The mean log capacity (over CSBs) for consumer monitoring service is 0.56.
to be used by CBSs.\textsuperscript{14} We average wages for those who work in counties/cities that belong to each CSB.\textsuperscript{15} SAMHSA (2012) provides evidence that counselors, social workers, private therapists, psychologists, and psychiatrists provide the majority of public mental health services and are thus good proxy variables.\textsuperscript{16} However, there are not enough observations in PUMS to include just these occupations.\textsuperscript{17} The proxy wage costs using the expanded sample of occupations explains 29\% of the variation of the restricted wage data.

We also merge community-specific data from IPUMS on total number of people,\textsuperscript{18} number of people at least 65 years old, number of people at most 18 years old, and number of people who live below the poverty line.\textsuperscript{19} The majority of people who receive services from CSBs are Medicaid recipients; thus the number of people covered by Medicaid in one CSB might affect the demand for services. Unfortunately, we do not have data on Medicaid population size for each CSB, and we include the number of people below the poverty line as

\begin{itemize}
\item \textsuperscript{14}We include psychologists, counselors, social service specialists, chiropractors, physician assistants, registered nurses, occupational therapists, physical therapists, radiation therapists, recreational therapists, respiratory therapists, massage therapists, nursing aides, psychiatric aides, home health aides, personal care workers, and service workers.
\item \textsuperscript{15}IPUMS has information on each individual’s present working area. It divides Virginia into 35 different areas. Some CSBs include more than one area, and some areas cover multiple CSBs. There are also some cases where a PUMS area includes only part of a CSB but also includes parts of other CSBs (e.g., PUMS area 2600 covers the Highlands CSB, part of the Mount Rogers CSB, and part of the Piedmont CSB. To generate wage rates for each CSB, we merge data across areas to match CSB boundaries as closely as possible.
\item \textsuperscript{16}Brolin et al (2012) present similar evidence for provision of mental health care at federally qualified health centers.
\item \textsuperscript{17}In particular, there are large (in absolute value) outliers for the Rappahannock/Rapidan CSB, Prince William CSB, and Alexandria CSB.
\item \textsuperscript{18}Hauenstein et al. (2007) find that residents of the most rural areas receive less mental health treatment than those residing in metropolitan areas, especially specialized mental health treatment. But Stern et al. (2010) find much weaker effects of rurality.
\item \textsuperscript{19}The same merging issues apply.
\end{itemize}
a proxy for the Medicaid population. Also, it may be that children and/or elderly people are likely to need a different level of mental health services than young and middle-aged adults (Stern, 2013), and the cost of providing such service may vary by age. Thus we include measures associated with the age distribution of each CSB.

Finally, we calculate the average distance between each CSB and the closest Virginia state psychiatric hospital. We include this variable because it might affect the units of service provided by each CSB in two ways. First, a CSB geographically close to a state psychiatric hospital might provide services to more people transferred from the state hospital. Second, a CSB far from any state hospital might be a better substitute for the state hospital because of transportation costs for the family and the CSB associated with using the state hospital. Our data allow us to determine which effect dominates the other.

Some of our explanatory variables may be endogenous. The funding variables are obvious examples. However, at this point, we are more interested in understanding essentially the correlation structure of the relevant variables than in specifying and estimating an identified structural model of service provision. We need only be careful in the way we interpret our estimation results.

2.2 Results

The estimates for log(# units provided) are reported in Table 4. We control for service-specific fixed effects. The analysis is decomposed into four cases: a) units measured in beds, b) units measured in FTEs, c) units measured in slots, and d) the total sample. With very few exceptions, estimates are qualitatively similar across units. Thus, for the most part, we discuss results only for the total sample. The effect of other sources of funding besides Medicaid is strong and statistically significant. State assistance increases service provision (0.718), and local assistance (relative to state assistance) increases it even more (0.251). It is not clear which way causation runs; service provision could affect state and/or local financial support, financial support could facilitate service provision, or both could be “caused” by another unobserved variable such as local demand for services. But it is clear that those CSBs providing high levels of service receive extra state and local resources. One possible reason for the state assistance effect is that the state’s allocation rules provide more resources to smaller counties.20 In fact, Figure 7 shows that, with the exception of one outlier CSB (Fairfax), there is a strong negative relationship between CSB catch-

20§ 37.2-509 of the Code of Virginia specifies the basis on which state funds are allocated to CSBs for 2005 and beyond. Relevant factors considered include total funds available, previous allocations, and local contributions. When the CSB system was initially established, funds were allocated based on the following relevant criteria (with minor revisions in 1998): a) the total funds available; b) the total amount of funds requested by each CSB; c) the financial abilities of all of the cities and counties participating in the CSB to provide local matching funds; d) the availability of services in each CSB’s service area; and e) funds for special programs, especially those serving larger regions. Initial criteria (c) and (d) are likely candidates for causing the observed variation is per capita state funds for CSBs.
ment size and per capita expenditures. The size of the log(state assistance) effect for the total sample is surprisingly large given that Medicaid funding is not included in either the state or local assistance variables. In particular, even excluding Medicaid funding issues, it would seem that a 1% increase in state funding should lead to an increase in services equal to 1% multiplied by the proportion of funding provided by the state: 0.44. A more careful analysis involving disaggregation across types of units explains the large estimate. The estimate specific to FTEs is 0.314, which is much more reasonable. The estimate for beds is 1.492, and Medicaid does not pay for increases in beds (or slots) associated with any service.

As discussed in Section 2.1, our proxy for the size of the Medicaid-eligible population is “people in poverty.” While the estimates are positive (0.230 for the total sample and 0.343 for FTEs), they are not statistically significantly different from zero (except for FTEs), but (maybe more importantly), only the estimate for beds is statistically significantly different from 0.44. An estimate of 0.44 would be consistent with services being proportional to need. The fact that the estimates are much less shows that services are significantly restricted by financing rules.

The estimates associated with age distribution imply that communities with

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**Table 4: Fixed Effects Estimates for log(# Units Provided by CSBs)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Sample</th>
<th>Beds</th>
<th>FTEs</th>
<th>Slots</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.662</td>
<td>1.340</td>
<td>2.822</td>
<td>1.645</td>
</tr>
<tr>
<td>log(State Assistance)</td>
<td>0.718**</td>
<td>0.219</td>
<td>0.437</td>
<td>0.314</td>
</tr>
<tr>
<td>Ratio: Local Assistance/State Assistance</td>
<td>0.251**</td>
<td>0.050</td>
<td>0.103</td>
<td>0.230*</td>
</tr>
<tr>
<td>log(People in Poverty)</td>
<td>0.235*</td>
<td>0.110</td>
<td>0.230</td>
<td>0.229</td>
</tr>
<tr>
<td>log(People Under 18 Years)</td>
<td>-0.255**</td>
<td>0.106</td>
<td>0.230</td>
<td>0.061</td>
</tr>
<tr>
<td>log(People Over 65 Years)</td>
<td>0.068</td>
<td>0.129</td>
<td>0.284</td>
<td>0.008</td>
</tr>
<tr>
<td>log(Distance: Closest State Psych Hosp)</td>
<td>0.299**</td>
<td>0.093</td>
<td>0.189</td>
<td>0.024</td>
</tr>
</tbody>
</table>

| Std Deviation of Within Service Error         | 1.618        | 1.573| 1.273| 1.929 |
| Std Deviation of Between Services Error       | 1.350        | 1.472| 1.250| 1.355 |
| R-Squared Within Service                      | 0.133        | 0.224| 0.162| 0.073 |
| R-Squared Between Services                    | 0.015        | 0.001| 0.162| 0.004 |
| R-Squared Overall                            | 0.048        | 0.158| 0.067| 0.025 |
| # Obs                                         | 860          | 230  | 476  | 154   |

Notes: Fixed effects are associated with different types of services
1) Fixed effects are associated with different types of services.
2) Double-starred items are statistically significant at the 5% level, and single-starred items are statistically significant at the 10% level.

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21 The relationship described in Figure 7 may be caused by rural counties having a higher proportion of Medicaid eligible people, by rural jurisdictions providing less local support for mental health services, or by state funding having some implicit fixed cost components built in to it.

22 t-statistics associated with $H_0 : \beta = 0$ are 5.66 for the total sample, -2.95 for beds, -3.90 for FTEs, and -2.66 for slots.

23 t-statistics associated with $H_0 : \beta = 0.44$ are 1.32 for the total sample, 2.41 for beds, -0.48 for FTEs, and 0.38 for slots.

24 Regressions of log(# Units Provided by CSB) on only a constant and log(poor in poverty) produce estimates of 0.920 for beds, 0.606 for FTEs, and 0.305 for slots. With the exception of beds, these are statistically significantly different from 1.0.
high proportions of young people provide fewer CSB services ($-0.255$), while estimated effects for communities with high proportions of elderly people are not statistically significant.\footnote{The literature generally finds that effect of age on mental health problems increases with age until the late thirties or forties and then significantly declines (Robins and Regier, 1991; Baldwin, 2005; Kessler et al., 2005; Stern et al. 2010; SAMHSA, 2012; Stern, 2013).}

The estimated effect of the distance from the closest state psychiatric hospital are interesting. On the one hand, one might think that proximity to a state psychiatric hospital would lead to increased need for CSB services, and thus increased services, because individuals leaving the hospital might be more likely to live close to the hospital. On the other, one might argue that distance from a state psychiatric hospital causes the use of state psychiatric hospitals to be a worse substitute than local care for people with significant mental health problems. The positive estimated effect ($0.299$) suggests that the latter effect dominates the former effect.\footnote{Between 2005 and 2010, Virginia reduced the number of state psychiatric beds by 15\% from 1659 to 1407.}

The estimated within-service and between-services standard deviations are both quite large implying that there is much variation in service provision across services (between) and CSBs (within) even after controlling for the explanatory variables included in the model. We see a similar story looking at the various $R^2$s. The between-services $R^2 = 0.015$ implying that variation in service provision across different services is not explained by the model. There is no particular reason why it should, thus the inclusion of service-specific fixed effects. On the other hand, we are explaining 13.3\% of the variation in service provision for a particular service across CSBs (which is reasonable given norms for cross-section regressions). Gottlieb et al. (2010) find significant variation in Medicare reimbursed mental health care provision nationally and attribute it to unexplained local variation in practice traditions. These results are also consistent with large variation in service provision for other medical services.
Table 5: Fixed Effects Estimates for log(Unit Cost for CSBs)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Sample</th>
<th>Beds</th>
<th>FTEs</th>
<th>Slots</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>Std Err</td>
<td>Estimate</td>
<td>Std Err</td>
</tr>
<tr>
<td>Constant</td>
<td>5.046 **</td>
<td>0.754</td>
<td>6.805 **</td>
<td>1.468</td>
</tr>
<tr>
<td>log(Local Wage Rate)</td>
<td>-0.200</td>
<td>0.248</td>
<td>-0.339</td>
<td>0.494</td>
</tr>
<tr>
<td>log(State Assistance)</td>
<td>-0.004</td>
<td>0.062</td>
<td>-0.103</td>
<td>0.127</td>
</tr>
<tr>
<td>Ratio: Local Assistance/State Assistance</td>
<td>0.059 **</td>
<td>0.025</td>
<td>0.001</td>
<td>0.049</td>
</tr>
<tr>
<td>log(Capacity)</td>
<td>-0.043 **</td>
<td>0.022</td>
<td>-0.001</td>
<td>0.039</td>
</tr>
<tr>
<td>log(People Under 18 Years)</td>
<td>-0.076</td>
<td>0.063</td>
<td>-0.168</td>
<td>0.133</td>
</tr>
<tr>
<td>log(People Over 65 Years)</td>
<td>0.120 **</td>
<td>0.072</td>
<td>-0.080</td>
<td>0.156</td>
</tr>
<tr>
<td>Std Deviation of Within Service Error</td>
<td>0.828</td>
<td>0.707</td>
<td>0.340</td>
<td>0.895</td>
</tr>
<tr>
<td>Std Deviation of Between Services Error</td>
<td>0.764</td>
<td>0.800</td>
<td>0.728</td>
<td>0.809</td>
</tr>
<tr>
<td>R-Squared Within Service</td>
<td>0.016</td>
<td>0.014</td>
<td>0.028</td>
<td>0.075</td>
</tr>
<tr>
<td>R-Squared Between Services</td>
<td>0.397</td>
<td>0.003</td>
<td>0.016</td>
<td>0.938</td>
</tr>
<tr>
<td>R-Squared Overall</td>
<td>0.106</td>
<td>0.014</td>
<td>0.023</td>
<td>0.217</td>
</tr>
<tr>
<td>#Obs</td>
<td>860</td>
<td>230</td>
<td>476</td>
<td>154</td>
</tr>
</tbody>
</table>

Notes:
1) Fixed effects are associated with different types of services.
2) Double-starred items are statistically significant at the 5% level, and single-starred items are statistically significant at the 10% level.

Table 5 presents results for log(unit costs) controlling for the same fixed effects. For cost, the results are not that stable across different types of units. In fact, for beds and slots, our explanatory variables have no predictive value. For FTEs, the results are a little more useful but still not particularly helpful in predicting variation in cost across CSBs. In this case, we are neither explaining any significant variation across or within services. We had anticipated that variation in local wage rates for counselors would help explain variation in cost. However, the estimated effect is very small and not statistically significant. In a regression with very few explanatory variables on the total sample, we estimate

\[
\log\left( \frac{\text{cost}_i}{\text{unit}_i} \right) = 3.696^{**} + 0.341^* \log(\text{wage}_i) - 0.239^{**} \log(\text{capacity}_i) + e_i
\]

with \( R^2 = 0.14 \), but the addition of other regressors makes the wage effect disappear. In the FTE equation, the only variables with some explanatory power are age distribution variables and local government support. The results suggest that communities can provide services to young people at lower cost \((-0.230)\) but must provide services to elderly people at higher cost \((0.189)\). Also, it suggests a relationship between local government assistance and cost \((0.077)\); those communities with high cost have more local government assistance. Again, the direction of causation is not clear.

As was discussed in Section 1, there are three margins to cut expenditures. Stern (2013) provides evidence that reducing eligibles is problematic because there already are many more people needing service than receiving service; and

27 Beecham, Knapp, and Fenyo (1993) document large, unexplained variation in the cost of community mental health provision as well.

28 White (2012) has similar results for explaining variation in cost across physical health care providers.
Ku et al. (2011) provide estimates for each state of the (large) number of new Medicaid enrollees associated with the ACA. The estimates in Table 6 suggest that, to the degree that service provision is sensitive to (especially) local funding, there may be some scope to reduce expenditure. One might interpret the parameter estimate for the ratio of local to state assistance to imply that local funding allows CSBs to provide other (less critical) services, thus allowing the state to reduce Medicaid spending. It might also imply that some portion of any reduction in Medicaid spending would be covered by local governments. However, it might also imply that reductions in Medicaid spending would lead to reductions in services so critical that fiscally strapped local governments would feel required to provide extra funding despite their own critical fiscal problems. Also, the fact that the estimated effect of eligible population is so small implies significant fiscally binding constraints.

On the other hand, the fact that almost none of the variation in unit cost can be explained suggests large opportunities to reduce unit cost. Some programs have large fixed costs and provide services to few consumers. For example, emergency services and crisis stabilization services can be very expensive because the nature of the service is to stand ready to provide services, which could result in many unproductive hours. Intake/Access services tend to have high unit costs because it has high no-show rates and demand is unpredictable though staffing is relatively fixed. The unit cost results suggest the need for greater understanding of unit cost variation.

3 Variation in Expenditure Between Medicaid and Private Insurance

3.1 Data and Estimation

We use data from Medical Expenditure Panel Survey (MEPS) to estimate the difference in total per unit cost and number of units of service consumed by people who are covered by private health insurance versus those who are covered by Medicaid. MEPS is a survey of families and individuals, their medical providers, and their employers, and it provides information on individual total medical expenditure. We collect information about each respondent’s medical expenditure on Mental Health or Substance Abuse (MHS) condition from two parts of the 2007 survey: the 2007 Event Level Conditions (ELC) and the 2007 Full Year Consolidated (FYC). The ELC file records the conditions reported by an individual respondent, and, for each condition, the number of events/visits for six types of services: home health care, hospital inpatient stays, hospital outpatient visits, office-based visits, hospital emergency room visits, and prescribed medicines. The MEPS uses ICD-9-CM codes to code the conditions, and then regroups them into CCS codes. Following Brown (2011), we choose conditions with CCS codes 650 – 662, and 670 as MHS conditions. The FYC file contains information on each respondent’s mental health status, health insurance coverage, and demographic variables, such as age, gender,
Table 6: Sample Selection Criteria for the MEPS Sample

<table>
<thead>
<tr>
<th>Cause</th>
<th># Obs</th>
<th>Proportion of Total</th>
<th># Remaining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing data on family income</td>
<td>90</td>
<td>0.024</td>
<td>3732</td>
</tr>
<tr>
<td>Missing data on mental health diseases</td>
<td>433</td>
<td>0.113</td>
<td>3299</td>
</tr>
<tr>
<td>Missing data on cost per visit</td>
<td>1896</td>
<td>0.496</td>
<td>1403</td>
</tr>
<tr>
<td>Number Remaining in Sample for # of treatments analysis</td>
<td>3299</td>
<td>0.863</td>
<td></td>
</tr>
<tr>
<td>Number Remaining in Sample for unit cost analysis</td>
<td>1403</td>
<td>0.367</td>
<td></td>
</tr>
</tbody>
</table>

marital status, race, religion, and education. It also records information on the respondent’s medical expenditure on those six types of services listed above. In this file, medical expenditure is the amount of money directly paid to health care providers during the year 2007. It includes separately out-of-pocket payments and payments by various health insurance sources. Thus medical expenditure in the MEPS measures total cost of health care.

Our sample includes individuals over 18 years old and with a MHSA condition. We exclude those individuals who have missing data on mental health status and family income. In this paper, we include family income as an explanatory variable rather than individual income because family income is probably more relevant concerning health care. The sample used to analyze the variation in number of treatments across people with different health insurance coverage includes 3299 individuals. To analyze the variation in average cost per treatment, we exclude individuals with missing data on average cost per treatment, either because of missing data on number of total treatments or because of missing information on total medical expenditure. The sample for cost analysis includes 1403 individuals.

We use two dependent variables: a) the number of events/treatments associated with MH/SA conditions for each individual, and b) the log of average total cost per event.29 The first two columns of Table 7 provide the sample moments for the variables to be used in the analysis of variation in total cost per unit service associated with MHSA conditions across people with different health insurance coverage.30 The first two columns of Table 7 provide the sample moments for the variables to be used in the analysis of variation in total cost per unit service associated with MHSA conditions across people with different health insurance coverage.

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29See, for example, Diehr et al. (1999) for a discussion of issues associated with measuring unit and total costs.

30We ignore issues concerning the possible endogeneity of type of insurance coverage. It is not obvious what we could use as an instrument especially since we have very limited geographical information. Pohlmeier and Ulrich (1995) ignore endogeneity issues and argue that they are not important because (in Germany) people have very little choice about insurance. Bao (2002) and ignores the issue and provide no discussion, and Frees, Gao, and Rosenberg (2011) mention it but do not address the problem. Methods such as those suggested by Hamilton (1990) and Alfò, Maruotti, and Trovato (2011) provide ways to handle endogeneity. But one needs instrumental variables to implement them. Goldman et al. (2002) claim to control for endogeneity but do not provide enough detail to determine how or whether their instruments are valid. Mello, Stearns, and Norton (2002) control for endogeneity by using geographical variation in health insurance choices as an instrument. Such a choice is not available for us because we do not observe geography and because, even if we did, all areas have both private
ple moments for the variables\textsuperscript{31} to be used in the analysis of variation in log total cost per unit service associated with MH/SA conditions across people with different health insurance coverage. Many papers in the literature interested in explaining the effects of health insurance on direct health cost for consumers choose out-of-pocket medical expenditure as the outcome variable. Most of the literature focusing on the total cost of medical care choose not to decompose total cost into the number of units of service and the cost per unit.\textsuperscript{32} In this paper, we care about how different health insurance coverage choices affect total social cost of health care, and we choose total cost per unit service (unit cost) as the dependent variable. In this sample, we exclude people who have no treatment for MH/SA conditions or people whose total expenditure on MHSA conditions is zero. The sample size is 1403. The sample moments show that there exist large variations in both unit cost and family income across individuals.

The sample is not representative of population in several ways. It includes more male, elder, and white people. Also, it has lower private health insurance coverage rates (0.53 vs 0.65) and higher Medicare (0.32 vs 0.14) and Medicaid

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|}
\hline
Variables & Avg. Unit Cost & # Treatments \\
& Mean & Std Dev & Mean & Std Dev \\
\hline
log(Unit Cost) & 4.748 & 0.967 & 3.535 & 10.262 \\
# Treatments & 5.021 & 1.764 & 4.959 & 1.716 \\
Age/10 & 10.356 & 1.047 & 10.454 & 1.010 \\
ln(Family Income) & 0.811 & 0.392 & 0.820 & 0.379 \\
Race/Ethnicity & 0.166 & 0.373 & 0.166 & 0.373 \\
White & 0.054 & 0.238 & 0.057 & 0.232 \\
Hispanic & 0.236 & 0.432 & 0.236 & 0.425 \\
Other & 0.356 & 0.474 & 0.373 & 0.484 \\
West & 0.247 & 0.433 & 0.250 & 0.433 \\
Male & 0.346 & 0.473 & 0.343 & 0.475 \\
Married & 0.448 & 0.497 & 0.493 & 0.500 \\
Education & 0.444 & 0.497 & 0.478 & 0.499 \\
GED/HS & 0.135 & 0.342 & 0.136 & 0.343 \\
BA/BS & 0.077 & 0.267 & 0.073 & 0.269 \\
Master/Doctoral & 0.089 & 0.281 & 0.085 & 0.279 \\
Others & 0.346 & 0.259 & 0.295 & 0.244 \\
Mental Health Problem & 0.527 & 0.499 & 0.562 & 0.496 \\
Private & 0.321 & 0.469 & 0.276 & 0.447 \\
Medicare & 0.289 & 0.454 & 0.217 & 0.412 \\
Medicaid & 0.191 & 0.199 & 0.046 & 0.208 \\
Other & \\
\hline
\end{tabular}
\caption{Moments of MEPS Variables}
\end{table}

\textsuperscript{31}The variable "Mental Health Problem" measures an individual’s mental health status and is constructed by the variable K6SUM42 in MEPS. In MEPS, there are six mental health-related questions, using the “K-6” scale developed by Kessler et al. (2003). These questions assess the individual’s non-specific psychological distress during the past 30 days. K6SUM42 is a weighted sum of six variables where weights measure intensity of problem. The “mental health problem” variable is (approximately) continuously increasing with the probability of having a mental health problem.

(0.29 vs 0.16) coverage rates than those of U.S. population.\textsuperscript{33} The coverage rates might be different because of the oversampling of elderly people in MEPS.

The last two columns of Table 7 provide the sample moments for the variables to be used in the analysis of variation in number of health care treatments associated with MH/SA conditions across people with different health insurance coverage. Figure 8 shows the distribution of individual choices about number of treatments, and it is clear that most individuals choose no service. This occurs frequently in the count literature (e.g., Mullahy, 1998; Deb and Trivedi, 2002; Tooze, Grunwald, and Jones, 2002) and is referred to as an excess of zero counts in the data. Following the literature (e.g., Pohlmeier and Ulrich, 1995; Diehr et al., 1999; Bao, 2002; Buntin and Zaslavsky, 2004; Elhai, Calhoun, and Ford, 2008; Frees, Gao, and Rosenberg, 2011), we consider the possibility that the process that generates the excess zeros is different from the one that generates positive count values.\textsuperscript{34} Thus, we use a zero-inflated Poisson model to examine the effects of demographic variables and health insurance coverage on people’s choice of number of units of treatment. The zero-inflated Poisson model uses a logit model for the process that determines an individual’s decision to receive any mental health treatment, and it uses a Poisson specification for positive units.\textsuperscript{35}

\textsuperscript{33}Statistics for the U.S. population statistics and health insurance coverage rates comes from DeNavas-Walt, Proctor, and Smith (2011).

\textsuperscript{34}This model is frequently called a two-part model. Manning et al. (1981), Pohlmeier and Ulrich (1995), and Diehr et al. (1999), among others, motivate the two-part model by suggesting that the patient might be making the Bernoulli participation decision and the physician the Poisson count decision. However, many other structures could generate the same two-part model (e.g., search costs of finding a provider, gatekeeper considerations).

\textsuperscript{35}We also experimented with a zero-inflated negative binomial model, but STATA failed to converge. Gilleskie and Mroz (2004) suggest a semiparametric specification for medical expenditures, and Tooze, Grunwald, and Jones (2002) use a random effects model with cross-
3.2 Results

Table 8 provides estimates of the effect of various individual characteristics on log unit health care cost. The key variables are the effects of having different types of health insurance on unit cost relative to having no insurance. The results show that unit costs are higher for people with all types of insurance (though the estimates for Medicare and Medicaid are not statistically significant). The difference between private health insurance and Medicaid is $0.256 - 0.081 = 0.175$, and the associated t-statistic is 2.15, implying that people with private health insurance pay more for the same medical services than people with Medicaid. This result is consistent with Hadley and Holahan (2003).

For private insurance relative to Medicare, the difference is $0.256 - 0.043 = 0.213$ with an associated t-statistic of 2.10. These results suggest that:

- Unit costs for mental health services provided at CSBs are, on average, lower than the same services provided by private providers (see Hadley and Holohan, 2003 for similar results). The lower rates occur because a) reimbursable rates are higher with private insurance than they are with Medicaid; b) the difference may reflect quality differences to some degree; and c) with Medicaid, the provider cannot recoup copayments and deductibles as one can with private insurance. The estimate in Table 8 is about the effect of having Medicaid on medical costs, not the effect of receiving services at a CSB. However, Medicaid recipients are very likely to receive services at a CSB. This is partially because Medicaid pays for many services that are in high demand, especially among people with chronic mental illness or SMI, that typically are not paid for by private insurance plans. Such services are rehabilitative in nature and are geared towards this population. Some examples of non-traditional services include but are not limited to residential treatment, intensive in-home services, therapeutic day treatment services and mental health support services. The estimates in Table 8 show significant unexplained variation in unit costs across CSBs. But the results in Table 8 show that average costs are lower.

- Efforts to move people with mental health problems away from CSB services to services provided by private providers has little promise for reducing Medicaid and/or state mental health expenditures except in those section data from MEPS and Santos Silva and Windmeijer (2001) construct a model to handle multiple sickness spells and estimate it using data from one wave of the German Socioeconomic Panel. Mello, Stearns, and Norton (2002) model the choice of insurance type and treat it as endogenous. Deb and Trivedi (2002) suggest that the critical break in structure is at a level greater than zero.

36 Holmes and Deb (1998) provide evidence that mental health care provided by non-physicians has lower unit costs and total costs than that provided by physicians (including psychiatrists). Thus, to the degree that CSBs use a mix of providers more heavily weighted towards non-physicians, their costs can be lower.

37 Private health insurance tends not to pay for these services because of their rehabilitative nature.
cases where unit costs are unusually high. Decker (2012) provides evidence that most private providers do not accept new Medicaid patients, and Decker (2009) and Ku et al. (2011) suggest Virginia will have significant difficulty increasing supply of private providers needed for Medicaid expansion without significant increases in Medicaid payment rates. If much of the variation is caused by fixed costs associated with large, low-demand services, then consolidation of small CSBs will be much more effective than privatization. However, to the degree that people in rural areas struggle to find mental health services (Hauenstein et al., 2007), consolidation may exacerbate the problem.

Most of the other explanatory variables are not statistically significant with respect to unit cost. The exceptions are male (0.166) and white (relative to black) (−0.237). Many studies (e.g., McCrone et al., 1998; Byford et al., 2001) construct unit cost measures in such a way that they can not vary with demographic characteristics. However, Lee, Liu, and Sales (2006) estimate that blacks receive 29% less ambulatory care than whites and spend 51% less on total care, implying that blacks have unit costs that are approximately 22% lower; this is the opposite of our estimate. They did not impute the change in unit cost themselves and thus never analyzed or conjectured why blacks would have lower unit costs. One possibility is that whites have better access to care, thus leading to lower prices for whites. However, blacks might use lower quality care, thus leading to lower prices for blacks. We think this issue deserves more attention, but it is not the focus of this paper.

Table 9 provides two sets of estimates for the effect of individual characteristics on units of treatment. We estimate logit parameters associated with the extensive margin whether to receive any mental health services, and we estimate Poisson count parameters associated with the intensive margin. The most important effects for this paper are those associated with health insurance. The results show that people with private health insurance (0.231), Medicare (0.281), and Medicaid (0.628) are more likely to use mental health care services than people without insurance. On the other hand, taking into account the intensive margin (Poisson regression), people with Medicare (0.045) and Medicaid (0.288) use more mental health services than those without insurance, while people with private insurance use less services (−0.075). There are two conflicting effects here: a) people with health insurance of any type can receive mental health services at lower out-of-pocket rates, making it more likely they will demand such services. On the other hand, people with mental health problems may find it more difficult to work at a job providing private insurance and/or navigate government bureaucracy to successfully apply for government

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38 Duan et al. (1983) also estimate models for both number of visits and total expenditure which would allow one to perform a similar analysis. However, they include no race variables in their analysis.

39 Padgett et al. (1994) provide evidence that minority groups with good private insurance receive less mental health care, even after controlling for other factors. This might suggest the existence of barriers to entry which could possibly lead to higher prices for those who do receive service.
Table 8: MEPS log Unit Cost

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimate</th>
<th>Std Err</th>
<th>Variable</th>
<th>Estimate</th>
<th>Std Err</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>0.166 **</td>
<td>0.054 **</td>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age/10</td>
<td>-0.015</td>
<td>0.084</td>
<td>GED/HS</td>
<td>0.019</td>
<td>0.069</td>
</tr>
<tr>
<td>(Age/10)^2</td>
<td>0.004</td>
<td>0.008</td>
<td>BA/BS</td>
<td>-0.010</td>
<td>0.098</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
<td></td>
<td>Master/Doctoral</td>
<td>-0.032</td>
<td>0.118</td>
</tr>
<tr>
<td>White</td>
<td>-0.237 **</td>
<td>0.080</td>
<td>Other</td>
<td>0.030</td>
<td>0.106</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-0.137 *</td>
<td>0.076</td>
<td>In(Family Income)</td>
<td>0.036</td>
<td>0.032</td>
</tr>
<tr>
<td>Other</td>
<td>-0.179</td>
<td>0.134</td>
<td>Mental Health Problem</td>
<td>0.121</td>
<td>0.110</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td>Type of Health Insurance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest</td>
<td>-0.053</td>
<td>0.083</td>
<td>Private</td>
<td>0.256 **</td>
<td>0.071</td>
</tr>
<tr>
<td>South</td>
<td>-0.083</td>
<td>0.077</td>
<td>Medicare</td>
<td>0.043</td>
<td>0.082</td>
</tr>
<tr>
<td>West</td>
<td>0.030</td>
<td>0.082</td>
<td>Medicaid</td>
<td>0.081</td>
<td>0.074</td>
</tr>
<tr>
<td>Married</td>
<td>0.051</td>
<td>0.058</td>
<td>Other Public</td>
<td>0.379 **</td>
<td>0.130</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td></td>
<td></td>
<td>4.268 **</td>
<td>0.392</td>
</tr>
</tbody>
</table>

Notes:
1) Sample size: 1403
2) Double-starred items are statistically significant at the 5% level, and single-starred items are statistically significant at the 10% level.

provided insurance. The results suggest that the latter effect dominates for the extensive margin (i.e., whether to receive any mental health service), but the former effect dominates for the intensive margin (how many units of service to receive). The difference between the estimates for private health insurance and Medicaid is $-0.075 - 0.288 = -0.363$ with an associated t-statistic of $-12.40$, suggesting that people on Medicaid use more service than those with private insurance. While this might occur because of other unobserved factors correlated with both Medicaid receipt and mental health problems, it also suggests that the demand for mental health services is price-elastic and mental health services with Medicaid is free (see, for example, Goldman et al., 1995; Diehr et al., 1999; Gilleskie and Mroz, 2004). The results for Medicare are consistent with this in that price is higher and Medicare limits mental health care provision in other ways.$^{40}$ The last two columns of Table 9 provide average marginal effects for each of the explanatory variables, combining the logit effect and the Poisson effect. Since almost all of the logit and Poisson effects have the same sign within a variable, there are no large surprises in the average marginal effect results.

Besides the insurance variables, there are a number of other variables that have statistically significant effects. With respect to the extensive margin (Logit Estimates), people in the South ($-0.329$) and married people ($-0.192$) are less likely to use mental health care services, and people with high mental health problem scores ($1.370$) are more likely. With respect to the intensive margin (Poisson Regression Estimates), Hispanics ($-0.078$) and people of race other than white or black ($-0.271$), married people ($-0.213$), high school dropouts use fewer services, and people in the North, people with higher income ($0.031$),

$^{40}$Medicare pays for “clinic option” services but not for “state plan option” services. For example, clinic option services for Region Ten represent 0.8% of revenues.
and people with high mental health problem scores (1.425) use more services. One should note that, since we are controlling for severity of illness with the “mental health problem” variable, the estimates associated with type of insurance should be interpreted as effects holding constant severity; i.e., these estimates do not suffer from differences in severity distributions across different types of insurance. In a somewhat different model, Hadley and Holohan (2003) find similar, though statistically insignificant results with respect to total medical expenditures for people in the South, married people, Hispanics, and people of race other than white or black.

Ku and Broaddus (2008) provide evidence that spending on total health care declines by 26% when changing insurance coverage from private insurance to Medicaid holding constant other characteristics. Our estimate of the same change for just mental health services is the percent decline in unit cost (from Table 8) of 17.5% plus the percent increase in units of treatment of 55% \[\approx (2.069 - 0.123)/3.535\],\(^{41}\) resulting in an increase in spending of 27.9%.

\(^{41}\)The numerator is the difference in marginal units of treatment from Table 9, and the numerator is the average \# treatments from Table 7.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Logit Estimates</th>
<th>Poisson Regression Estimates</th>
<th>Estimated Average Marginal Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate</td>
<td>Std Err</td>
<td>Estimate</td>
</tr>
<tr>
<td>Male</td>
<td>0.054</td>
<td>0.078</td>
<td>0.056 **</td>
</tr>
<tr>
<td>Age/10</td>
<td>-0.218 *</td>
<td>0.124</td>
<td>-0.010</td>
</tr>
<tr>
<td>(Age/10)(^2)</td>
<td>0.022</td>
<td>0.012</td>
<td>-0.003</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>-0.147</td>
<td>0.136</td>
<td>0.026</td>
</tr>
<tr>
<td>Other Race</td>
<td>-0.328 *</td>
<td>0.194</td>
<td>-0.271 **</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-0.121</td>
<td>0.112</td>
<td>-0.078 **</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest</td>
<td>-0.228 *</td>
<td>0.123</td>
<td>-0.428 **</td>
</tr>
<tr>
<td>South</td>
<td>-0.320 **</td>
<td>0.115</td>
<td>-0.582 **</td>
</tr>
<tr>
<td>West</td>
<td>-0.214 *</td>
<td>0.123</td>
<td>-0.433 **</td>
</tr>
<tr>
<td>Married</td>
<td>-0.192 **</td>
<td>0.085</td>
<td>-0.213 **</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GED/HS</td>
<td>-0.144</td>
<td>0.103</td>
<td>0.155 **</td>
</tr>
<tr>
<td>BA/BS</td>
<td>0.182</td>
<td>0.141</td>
<td>0.476 **</td>
</tr>
<tr>
<td>Master/Doctoral</td>
<td>0.277</td>
<td>0.171</td>
<td>0.691 **</td>
</tr>
<tr>
<td>Other</td>
<td>0.211</td>
<td>0.156</td>
<td>0.473 **</td>
</tr>
<tr>
<td>In(Family Income)</td>
<td>-0.024</td>
<td>0.064</td>
<td>-0.031 **</td>
</tr>
<tr>
<td>Mental Health Problem</td>
<td>1.370 **</td>
<td>0.162</td>
<td>1.425 **</td>
</tr>
<tr>
<td>Type of Health Insurance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>0.231 **</td>
<td>0.091</td>
<td>-0.075 **</td>
</tr>
<tr>
<td>Medicare</td>
<td>0.281 **</td>
<td>0.125</td>
<td>-0.045</td>
</tr>
<tr>
<td>Medicaid</td>
<td>0.628 **</td>
<td>0.108</td>
<td>0.288 **</td>
</tr>
<tr>
<td>Other Public</td>
<td>-0.060</td>
<td>0.180</td>
<td>-0.088 **</td>
</tr>
<tr>
<td>Constant</td>
<td>0.181</td>
<td>0.562</td>
<td>1.465 **</td>
</tr>
</tbody>
</table>

Notes:
1) Sample size: 3299
2) Double-starred items are statistically significant at the 5% level, and single-starred items are statistically significant at the 10% level.
4 Implications and Conclusion

4.1 Summary of Empirical Results

We performed two different types of analysis in this paper: one using a cross-section of data on costs and service provision of CSBs in Virginia, and the other a cross-section of data with information about cost and service usage of individuals in the United States. From the CSB data analysis, we learned that the best predictors of variation in service provision across CSBs are variation in state and local financing and variation in the distribution of age. The results imply significant sensitivity to non-Medicaid provision of resources suggesting that Medicaid is not providing care to all who need it.

We also observe some significant variation in per capita state support, and therefore CSB expenditures by rurality. While there is much evidence that services are scarcer in rural communities, as a policy matter, it is not clear why state financing rules should subsidize rural counties that want to avoid paying for services. We should gain a better understanding of whether this variation is due to variation in local expenditures, variation in poverty rates, or something else and then construct a policy that provides good incentives to local governments and good service to those people in need.

On the cost side, we have weak evidence of cost varying with local wage rates and with capacity. It is weak in that, once one controls for other community characteristics, these effects disappear. The only robust effects are with respect to variation in the age distribution; i.e., young people are less costly to serve and senior citizens are more expensive to serve. Overall, however, we can explain almost none of the variation in unit cost across CSBs despite the wide variation in such costs. It is critical for the effectiveness of any program aimed at reducing costs effectively to understand the causes of this variation.

The CSB data provides no information about costs and benefits of mental health services between a public and private system because we see only variation across public CSBs. However, our other source of data, MEPS, provides us with information about average marginal differences in behavior for those receiving publicly financed services vs those receiving privately financed services. These are informative about costs associated with a public CSB system because a) most service financed by Medicaid is provided at public CSBs and b) many services needed by people with chronic or severe mental health problems are paid for by Medicaid and not private sources and are more likely to provided in a CSB setting than by a private provider. We estimate that mental health services financed by Medicaid are 17.5\% less expensive than those financed with private health insurance. The lower rates occur because a) reimbursable rates are higher with private insurance than they are with Medicaid; and b) with Medicaid, the provider cannot recoup copayments and deductibles as one can with private insurance. Overall, our results suggest that efforts to move people with mental health problems away from CSB services to services provided by private providers has little promise for reducing Medicaid and/or state mental health per unit cost except in those cases where unit costs are unusually high.
With respect to units of service provision, our results show that insurance coverage increases service provision. Thus, to the degree that it increases insurance coverage, the Affordable Care Act (ACA) will lead to large increases in demand for mental health services. If the one approximates the ACA as moving 0.326 million people\footnote{This estimate is based on internal estimates from the VACS and The Commonwealth Institute, 2012.} from no insurance to insurance that looks like Medicaid,\footnote{A large number of people would move to a health exchange. For the purposes of this analysis, we will treat them as receiving service from private providers and thus not affect the analysis.} then the increase in service demand in Virginia is $0.326 \times 3.535 \times (1 + 0.628) \times (1 + 0.288) = 2.416$ million more service units.\footnote{Table 7 reports average # service units is 3.535, and Table 9 estimates a marginal effect of Medicaid coverage on the probability of using services of 0.628 and a marginal effect of the rate of service use (conditional on any use) of 0.288.} If an MCO can induce individuals to behave like owners of private insurance, then the increase in service demand is instead $[0.326 \times 3.535 \times (1 + 0.231) \times (1 - 0.075)] - [0.042 \times 3.535 \times (0.075 + 0.288)] = 1.258$ million,\footnote{Table 9 estimates a marginal effect of private insurance coverage on the probability of using services of 0.231 and a marginal effect of the rate of service use (conditional on any use) of $-0.075$. The number of Medicaid recipients receiving mental health services in Virginia is presently 0.042 million. The last term in brackets represents the reduction in service units for those already receiving mental health care services financed by Medicaid.} a savings of 1.158 million units of service. However, much of this reduction is due probably to services that are covered by Medicaid and not by private insurance (or Medicare) and thus should be included in the effects only if one considers having the MCO no longer cover those services. Unfortunately, we have no way to decompose the reduction in service usage between those that might be relevant to the introduction of an MCO and those that would not because the required data on detailed service provision is not available in MEPS (or any other data set we know of).

### 4.2 Questions

We consider three critical questions associated with the value of using a MCO to regulate and coordinate mental health care in Virginia. For each question, we summarize how our results provide information about the answer:

1. **What explains variation in cost and services for CSBs and individuals?**
   This is a critical question because, without such knowledge, an MCO will not know how to reduce costs and/or services in a way that minimizes harm to service recipients. For example, if people covered by Medicaid use more mental health services because the cost of service is lower than for people covered by private insurance, then this is a classic moral hazard problem and should be addressed by giving people more incentive to internalize cost. This probably would involve the use of copayments or managed care. On the other hand, if they are using more service because they have more severe problems or require services not covered by private...
insurance, then there is really no margin to reduce cost without jeopardizing quality of care. Similarly, if variation in cost across CSBs represents variation in efficiency of service provision, then pressure put on inefficient CSBs should be effective in reducing cost. However, if the variation is due to, for example, differences in local input costs, then again there is no margin to reduce cost. Our results with respect to individual behavior can not quantify a moral hazard effect and provide no information about the type of services being used. While we can control for a moderately useful measure of illness severity, we still can not decompose effects in a meaningful way. Thus, more work is needed to answer the question. With respect to CSB behavior provide hints but no robust answers. We have some weak evidence that variation in local wages and capacity are important. But, overall, we have not succeeded in explaining much variation in cost using the variables suggested by others in the literature. This suggests that there might be large gains to be had associated with analysis of high-cost programs. However, this is only a possibility and not a sure thing. Our MEPS cost estimates suggest that publicly provided mental health services have significantly lower unit costs than privately provided services. This result, by itself, should make one pessimistic about the benefits of an MCO trying to induce CSBs to behave more efficiently. There might be gains for a relatively small number of inefficiently provided programs, but, on average, CSB provided services are already quite cost-efficient.

2. What are the effects of inducing CSBs to behave more like private providers and/or encouraging Medicaid recipients to make more use of private providers? One of the ideas associated with the introduction of a MCO is to encourage more competition among various providers. However, the fact that private providers are more expensive suggests that they are not in a good position to provide competition for CSB business. Furthermore, unless a MCO has a good sense of the cost function for publicly provided services, it is not in a good position to push for more efficient service provision. Thus, significantly more must be learned about the cost function before an MCO or any organization can effectively reduce expenditures without jeopardizing quality of care.

3. What could a MCO do to improve the public provision of mental health services? The issue that has received the most attention and is probably to catalyst for changing the system is expenditure reduction. We have already addressed what our results can say about this in the two previous questions. The key is to find inefficient programs and help them or force them to become more efficient. The risk is, that in the process of doing this, the MCO reduces quality and/or quantity of important services. There is room for improvement though. Virginia changed its reimbursement structure for child service provision to encourage use of local services and discourage use of very expensive remote residential services.\footnote{See the 2008 Appropriations Act, Chapter 879, Item 283, C 3.d.}
maybe somewhat ironically, it began using some of the CSBs as screen-
ing “gatekeepers” for the provision of expensive child services provided
by private providers. However, while both of these policy changes were
effective in reducing expenditure with no reduction in service quality, nei-
ther required a MCO to initiate. Thus, the question arises what special
features would a MCO have that would allow it to accomplish cost savings
unattainable through other efficiency mechanisms. Maybe a MCO could encourage focusing on high quality outcomes rather
than the provision of service. Some of the Pay-for-Performance experi-
ments in the ACA focus on such changes. However, it is not yet clear
whether such programs work well, and it is not clear how to apply them
to CSBs with clients with difficult-to-measure outcomes. So far, the state
and individual CSBs have not made much progress in measuring relevant
outcomes.\textsuperscript{47} Also, it is not clear what advantage a MCO has in impli-
menting such an incentive over alternatives.

Overall, while our results provide some important information necessary for
predicting the effectiveness of a MCO, they also point to areas where we do not
know enough yet. Though the necessary data to evaluate these questions do
not exist (to our knowledge), much of it could be collected and analyzed by the
state.\textsuperscript{48} We encourage the state to do so.

References

idents in Metropolitan Miami, Florida: The Role of Depression and the
Co-Morbid Effects of Substance Use.” \textit{Journal of Mental Health Policy and

\textsuperscript{47}Presently, the 7 measures the state is focusing on are a) percent of individuals receiving
assertive community treatment services with stable housing, low hospitalization, and no ar-
rests in the previous 12 months; b) percent of adults with serious mental illness admitted to
mental health services who received at least 1 community mental health case management
service in the previous 12 months and were employed full- or part-time or received supported
employment services at any point in the 12 months; c) percent of adults admitted to men-
tal health services during the previous 12 months with serious mental illness who received
at least 1 hour of case management services within 30 days and at least 5 additional hours
within 90 days of admission; d) percent of adults admitted to substance abuse services during
the previous 12 months who received at least 1 hour of outpatient services after admission
and at least 2 additional hours within 30 days of admission; e) percent of all individuals ad-
mitt to substance abuse services in the previous 12 months who received at least 1 valid
substance abuse or mental health service in the month following admission and at least 1
valid service every month for the following 5 months (excluding services provide in jails and
juvenile detention centers); f) average calendar days from date of first contact or service re-
quest to first scheduled appointment accepted for all individuals admitted in the previous 12
months to substance abuse services; g) percent of children admitted to mental health services
in the previous 12 months who received at least 1 hour of outpatient services within 30 days
of admission and at least 2 additional hours within 30 days of admission. Only (a) and (b)
have any notion of outcomes associated with them; the others are purely measures of inputs.

\textsuperscript{48}Work such as Beecham, Knapp, and Fenyo (1991) provides information on how to do
careful cost studies.


