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Patterns of Care for Rural and Urban Children with Mental Health Problems

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EXECUTIVE SUMMARY

Introduction

Research indicates that privately insured, rural adults have lower use of office-based mental health services, but higher use of prescription medicines than their urban counterparts. Similar studies for rural children have been limited to specific populations, diagnoses, or to single states. Patterns for rural children may be different than those of urban children and adults generally because of their high enrollment in Medicaid and the State Children's Health Insurance Program, which tend to have more generous behavioral health benefits than private coverage and may equalize rural-urban treatment patterns. On the other hand, the more limited supply of specialty mental health providers in rural areas, particularly for children, could lead to lack of access and lower utilization of some types of mental health services in rural areas versus urban.

Methods

Using data on children ages 5-17 from the 2002-2008 Medical Expenditure Panel Survey, this study examines two research questions: 1) do patterns of children's mental health diagnosis and service use (e.g., office visits and psychotropic medications) differ by rural-urban residence? and 2) what is the effect of income and insurance type on use of mental health services?

Findings

Controlling for demographic and risk factors, rural children are as likely as urban children to have an attention deficit or hyperactivity disorder (ADHD) diagnosis and less likely to have any other type of psychiatric diagnosis. Initially observed higher prevalence of mental health diagnoses among rural children is explained by underlying differences in demographic characteristics and risk factors, such as higher rates of poverty, public coverage, mental health impairment, and lower prevalence of minorities. Rural children with the highest mental health need are no more or less likely to be diagnosed or treated for mental health conditions. However, among those with a possible impairment, rural children are less likely to be diagnosed with a psychiatric illness other than ADHD and are less likely to receive counseling.

Discussion and Policy Implications

Rural children are significantly less likely to be diagnosed and treated for non-ADHD mental health problems than urban children and are less likely to receive mental health counseling. The rural-urban difference is greatest when looking at children with possible impairment. Since sub-acute mental health issues may or may not indicate a need for treatment, it is not certain that this disparity needs to be addressed. However, the lack of mental health specialty providers in rural areas means there is, in many cases, no provider available to determine whether treatment is indicated. A realistic approach to this problem may be the development of assessment protocols for use by non-specialists such as school counselors and primary care practitioners to help determine those with the greatest need and guide referrals. Parent support and training has been shown to be helpful in treating children with ADHD and other behavioral issues and may have utility for rural children by providing indirect access to mental health professionals.

INTRODUCTION

While prevalence estimates of children's mental health problems* vary, it is clear that only a portion – roughly half -- of children needing help receive treatment from a mental health professional.[1] Comparing rural children to urban, a significantly smaller proportion receives a mental health visit than urban children (7.1% vs. 9%).[2] Prior research indicates that privately insured, rural adults have lower use of office-based mental health services, but higher use of prescription medicines than their urban counterparts.[3] Similar studies for rural children have been limited to specific populations (e.g., child welfare), diagnoses (e.g., attention deficit disorder or Autism) or to single states.[4,5,6] Patterns for rural children may be different than for urban children and adults generally, because of their high enrollment in Medicaid and the State Children's Health Insurance Program (SCHIP),[7,8] which tend to have more generous behavioral health benefits than private coverage and may equalize rural-urban differences in treatment patterns. Lack of adequate health insurance may influence whether or not a child receives services as well as the type of treatment received.[9] On the other hand, the more limited supply of specialty mental health providers in rural areas, particularly for children,[10] could lead to lack of access and lower utilization of some types of mental health services in rural areas versus urban.

Psychotropic medications are those that affect the mind, emotions, and behavior and are also referred to as psychiatric or psychotherapeutic medications. These drugs include antipsychotics, antidepressants, mood stabilizers, anxiolytics, and stimulants and are used to treat specific symptoms. For example, antipsychotics are used in the treatment of delusions or hallucinations, such as in schizophrenia, and stimulants for the treatment of attention deficit

* Mental health problems include conditions such as attention-deficit/hyperactivity disorder, mood disorder, conduct disorder, panic disorder or generalized anxiety disorder, and eating disorders.

hyperactivity disorder (ADHD).[11] While psychotropic medications can hold great benefit for children who need them, prescribing these powerful medications to children and adolescents could be inappropriate when providers lack training, diagnosis is difficult,[12] or when prescriptions substitute for other mental health services.[13] Findings have been mixed in establishing variation in rural-urban use of psychotropic medications. In treating children with psychotropic medications, the American Academy of Child and Adolescent Psychiatry (AACAP) notes that beginning with pharmacological treatment may be a best first step in certain cases, though psychosocial treatment is traditionally recommended before pharmacological treatment.[14] However, counseling or therapy occurs among only a portion of children receiving psychotropic medication and we found no studies that examine rural-urban differences.[15,16,17]

Given variation in receipt of mental health services and in the content of these services, we examine patterns of mental health care for rural and urban children. Using data from the 2002-2008 Medical Expenditure Panel Survey (MEPS), this study examines two key research questions: 1) do patterns of children's mental health diagnosis and service use (e.g., office visits and psychotropic medications) differ by rural-urban residence? and 2) what is the effect of family income and type of insurance on the use of mental health services?

BACKGROUND

Prevalence of Mental Health Problems Among Children

Prevalence estimates of children's mental health problems vary based on definition and clinical criteria. In 2005-06, an estimated 5.4% of U.S. children had a mental health problem, such as depression, anxiety, eating disorder, attention deficit or hyperactivity disorder (ADHD), or other emotional problem.[18] Other estimates suggest a somewhat larger percentage -- 7.5% --

of children had a behavioral or mental health problem in 1997-2002.[19] Using disorders defined in the Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (DSM-IV), approximately 13.1% of U.S. children ages 8-15 had one or more mental health disorders during 2001-04, including 1.8% who had two or more disorders.[1] Children living in poor families were more likely to report mental health problems compared to children in higher income families.[20,21]

In a prior study using data from the National Survey of Children with Special Healthcare Needs, we found that children living in rural areas were slightly but significantly more likely to have a mental health problem compared to children living in urban areas (5.8% versus 5.3%). Rural children were also more likely to have a behavioral difficulty and to be usually or always affected by their condition compared to rural children.[18]

Prevalence by Diagnoses

Based on DSM-IV defined disorders, ADHD is the most common mental health diagnosis of childhood. Among all children, 8.6% had ADHD, followed by mood disorders at 3.7%, conduct disorders at 2.1%, anxiety disorders at 0.7%, and eating disorders at 0.1%.[1] Several sociodemographic factors are associated with these diagnoses, particularly young age, male gender, and Medicaid coverage. Having a relatively young age for a child's school grade doubled the chance that a student would be diagnosed with ADHD and treated with stimulants.[12] Boys were more likely than girls to receive a mental health diagnosis largely as a result of their high rates of ADHD, while girls had higher rates of mood disorders.[1] Diagnoses of ADHD and disruptive behavior were more common among children covered by Medicaid (47%) compared to those with private insurance (26%).[22]

Variation in Treatment Rates

Treatment for children's mental health problems varies by diagnosis and demographic characteristics, including rural and urban residence. Among children with a mental health disorder, approximately half (50.6%) received treatment for their disorder within the past year. Treatment rates were highest for those with ADHD and conduct disorder (47.7% and 46.4% respectively), while those with anxiety or panic disorder had lower treatment rates (32.2%).[1] Boys were more likely to seek mental health treatment than girls[1] and were more likely to use stimulants[23,24] and antidepressants.[25] White children were more likely to use medications than those in any other racial/ethnic group.[5,24,16,26,27,28] Treatment rates were highest among those children with greater functional impairment,[24,1] behavioral disorder,[29] disability,[5] and those with a comorbid substance use disorder or recent suicide attempt.[25]

Rural children are less likely to receive mental health treatment generally compared to urban children and use of psychotropic medication may also be lower among rural children. Receipt of initial mental health treatment is similar between children living in rural and urban areas;[19] however, rural children were less likely than urban children to receive all the mental health services their parents thought they needed .[18] Children living in the most remote rural areas are least likely to receive mental health treatment[27] and rural residents age 15 and older were less likely to use specialty mental health services than urban residents.[30] Findings have been mixed in establishing variation in rural-urban use of psychotropic medications. In one study, children living in remote rural areas were least likely to use stimulants compared to children living in more populated areas.[23] Rural children in the child welfare system were more likely to be given psychotropic medications than their urban counterparts, especially among rural

children in poor households.[6] Other studies found no difference between rural and urban areas[31,24] or greater use of autism medications when children lived in less populated counties.[5]

Treatment with Psychotropic Medications

The use of psychotropic medications in children has increased over the past twenty years, coinciding with studies establishing the appropriate use of these drugs in children and the growing role of primary care physicians and pediatricians in identifying and treating children's mental health problems.[32] Between 1993-94 and 1997-98, the proportion of pediatric office visits during which stimulants and other psychotropic drugs were prescribed increased from approximately 5% to 25%.[33] At the individual level, stimulant use grew from 2.9% of U.S. children in 1996 to 3.5% in 2008.[34] The rate of antidepressant treatment increased from 6% in 1996 to 10% in 2005, or from 13 to 27 million persons over age 5.[16] Between 2001 and 2010, ADHD medication use increased by 50% among children with commercial health insurance.[35] Stimulant use also increased for children with public coverage between 1996 and 2008, though that increase was not significant.[34] Use of these medications increased among the youngest children. Between 1999-2000 and 2007, the rate of antipsychotic treatment among privately-insured children ages 2-5 approximately doubled from 0.78 per 1,000 to 1.59 per 1,000.[36]

Despite growth in the treatment of children's mental health problems with psychotropic medications, it is unclear if these cases are treated appropriately. In examining age at the start of kindergarten, younger children were more likely to be diagnosed with ADHD, suggesting that immaturity may play a role in diagnosis rather than an actual biological condition.[12] While the U.S. Food and Drug Administration (FDA) has approved antipsychotics for children in the treatment of schizophrenia, behavioral symptoms in autism, Tourette's disorder and bipolar episodes, nearly three-quarters of Medicaid covered children treated with antipsychotics in 2004

were diagnosed only with conditions that did not have an FDA indication (e.g., ADHD without a diagnosis of schizophrenia, bipolar disorder, or autism); among children with private insurance, this proportion exceeded 70%.[22]

Characteristics of children receiving psychotropic drugs

Controlling for demographic and physician characteristics, the factors impacting receipt of stimulants included living in the South, being white, having health insurance, receiving mental health counseling, and not receiving psychotherapy.[15] Children in foster care or the child welfare system,[37,38,29] those with a traumatic brain injury,[39] and autism spectrum disorder[5] were more likely to use psychotropic medication than children without those characteristics. A significant portion of these children received multiple psychotropic medications. For example, among Texas children in foster care, 73% received two or more psychotropic medications and 41% received three or more,[26] while 20% of Medicaid children with autism spectrum disorder used three or more psychotropic medications concurrently.[5] Medication combinations are used commonly in patients to treat multiple disorders in the same patient, offer treatment advantages for a single disorder, address side effects of a successful drug, and when transitioning from one drug to another.[14] At the national level, a greater proportion of generalists prescribed psychotropic drugs to rural youth (34.3%) compared to urban youth (13.5%).[31]

Health insurance and family income influence access to psychotropic medications. Medicaid-covered youth are more likely to use psychotropic medication than those without any type of coverage.[29] Antipsychotic use was lower among privately insured youth (0.9%) compared to youth covered by Medicaid (4.2%) in 1996-2000.[22] Commercially insured children living in affluent areas are more likely to use a stimulant than children from lower income areas, though this study did not include the lower income population that could be Medicaid eligible.[23]

Medication use in combination with counseling or therapy

The American Academy of Child and Adolescent Psychiatry (AACAP) recommends several steps to health professionals to ensure appropriate and safe use of psychotropic medications for the treatment of children. These steps include patient evaluation, development of a psychosocial and psychopharmacological treatment plan, monitoring the plan for short and long-term outcomes, and child and parent education by prescriber of child's problems, treatment options, and treatment plan. Psychosocial treatment is traditionally recommended before pharmacological treatment, though the AACAP notes that beginning with pharmacological treatment alone may be a best first step in communities without appropriate psychosocial providers or for children with disorders that preclude active participation.[14] Only a limited proportion of children receiving medication appear to follow these recommendations, however. Between 1999-2000 and 2007, less than half of children ages 2-5 receiving antipsychotic treatment also received a mental health assessment (40.8%), a psychotherapy visit (41.4%), or a visit with a psychiatrist (42.6%) during the year of antipsychotic use.[36] Counseling or therapy occurs among only a portion of children receiving psychotropic medication. Among children prescribed stimulant medication in 1995, mental health counseling was provided for 47% of children and psychotherapy was provided for 22% of children.[15] Between 1996 and 2005, treatment with antipsychotic medications increased while psychotherapy decreased.[16] Among children ages 5-17 in 2007, a higher percentage of treatment expenditures for ADHD went to prescription medications over ambulatory visits (64% versus 22%).[17]

In a 2000-04 national study of self-reported depression across all ages, rural residence was associated with a higher likelihood of receiving pharmacotherapy and a lower likelihood of receiving minimally adequate psychotherapy, a difference the authors found to be mediated by

the supply of mental health specialists. The authors suggest that the lack of access to psychotherapists in rural areas may cause rural individuals with depression to rely more on antidepressant medications than on counseling.[13]

METHODS

Data and Sample

We analyzed data from all respondents to the Medical Panel Expenditure Survey (MEPS) Household Component survey from the years 2002-2008 who were between 5 and 17 years old. The MEPS is a nationally representative sampling of the U.S. civilian, non-institutionalized population, providing data on demographics, health status, parent identifiers, and health service use.[40] The MEPS is constructed using an overlapping panel design, with each respondent completing 5 rounds of interviews over 2 years, and a new panel of respondents selected and surveyed annually. Interview information is verified by telephone and medical record reviews are conducted with participants' physicians, prescription medication providers, and other caregivers. Race was based on parent report using categories pre-defined by MEPS: white, non-Hispanic; not white, non-Hispanic; and Hispanic.

Office-Based Visits

Survey respondents were linked to detailed information on their office-based visits via the Medical Provider Component of the MEPS Office-Based Visit file. With permission of the household, the MEPS surveyor contacts medical providers regarding information that a household could not reliably provide, specifically visit details such as type of provider seen and care provided. Our analysis focused on types of treatments coded as "Psychoth" for

psychotherapy/counseling. We followed detailed instructions from the MEPS online handbook to construct and link survey respondent files.

Dependent Variables

The dependent variables in this study were the presence of a mental health diagnosis, outpatient psychotherapeutic care visits, and psychotropic prescription medication use (Figure 1). The MEPS collects all health care claims for each calendar year the respondent participates in the survey. Claims are aggregated into one of eight different event files: prescription medicines, dental visits, other medical expenses, hospital inpatient stays, emergency room visits, outpatient department visits, office-based medical provider visits, and home health. MEPS also collects person-level data concerning demographic characteristics; the most relevant of these for our study were general demographics, region, health insurance and service use variables. Mental health diagnoses were identified using the MEPS Medical Conditions file, which summarizes self-reported diagnosis information collected from different parts of the survey. Professional coders convert the verbatim text reported by respondents into ICD-9 diagnosis codes. We identified children with a parent-reported mental health diagnosis using ICD-9 codes 290 through 316 (see Appendix for codes and definitions). Children with an ADHD diagnosis were grouped using ICD-9 code 314, and we defined "other psychiatric diagnosis" as children with all mental health diagnoses other than ADHD.

Figure 1. Patterns of Use Variables Definitions

Variable	Description
Any Psychiatric Diagnosis	Children who have one or more self-reported psychiatric diagnoses documented in the Medical Conditions file, identified using ICD-9 codes 290 – 316.
ADHD Diagnosis	Children who have a self-reported ADHD diagnosis (ICD-9 code 314)
Other Psychiatric Diagnosis	Children who have any self-reported psychiatric diagnosis except ADHD
Mental Health Prescriptions	All drugs in MTC "Psychotherapeutic Medications" PLUS those in "Stimulant Medications" (described below).
Stimulant Medications	Drugs in MTC "Central Nervous System Agents" and Sub-Class "CNS Stimulants"
Mental Health Counseling	Office-based visits with any provider classified as "psychotherapy or counseling"
Mental Health Treatment	Four or more office-based with any provider classified as "psychotherapy or counseling"
Psychiatrist Visits	Office-based visits where provider specialty is Psychiatry

We coded several variables to identify mental health prescriptions using the Multum Therapeutic Class[†] (MTC) typology included with the MEPS prescription medicine file. We defined "mental health prescriptions" using MTC code for "Psychotherapeutic Medications." Because ADHD is the most prevalent mental health condition among children and stimulants are the prevailing treatment, we also created a variable to identify receipt of a stimulant medication using MTC "Central Nervous System Agents" and sub-class "CNS Stimulants." In a preliminary analysis, we also coded additional mental health prescription variables for specific drug classes, including atypical antipsychotics, benzodiazepines, and anxiety medications. The prevalence of

[†] Multum Lexicon from Cerner Multum, Inc. http://www.multum.com/Lexicon.htm

each of these drug classes was very low among children in the sample (<1% in most cases), and we found no significant rural-urban differences in utilization.

Finally, we created several mental health-related office visit variables. We defined "mental health counseling" visits as those classified as "psychotherapy or counseling" in the MEPS office-based visit file. Children with four or more such visits are coded as receiving "mental health treatment;" four visits was selected as a logical breakpoint based on the distribution of the data. Psychiatrist visits were also coded, based on the provider specialty.

Independent Variables

The independent variables are rural-urban residence and the presence of a mental health problem. Rural and urban areas are identified based on the Office Management and Budget metropolitan and nonmetropolitan county designations. To evaluate the contribution of the independent variables on the dependent variable, we used the likelihood ratio test, calculating our logistic regression models with and without each independent variable. We found that Hispanic ethnicity negatively predicted any mental health diagnosis and mental health counseling for all children and those with possible impairment. To demonstrate this effect, we present partially adjusted models with all independent variables except for race and ethnicity and a fully adjusted model with all independent variables including race and ethnicity.

Mental health problems were identified by the Columbia Impairment Scale (CIS), a validated measure of functional impairment in childhood psychiatric illness.[41] This scale incorporates a rating system for 13 questions regarding the child's behavior and function at home and school.[‡] Parents answer these questions on a scale from 0-4, with 4 indicating a serious

[‡] Parent-reported measures in the CIS were correlated with clinician assessment. The CIS was tested at four sites as part of the NIMH Epidemiology of Child and Adolescent Disorders Study. The CIS was given after parents

problem. The CIS is asked of MEPS respondents for each year. The 13 questions are described in Figure 2.

Figure 2. Columbia Impairment Scale Questionnaire

Columbia Impairment Scale Questionnaire, Rate from 0-4

In general, how much of a problem do you think he/she has with:

1) getting into trouble?
2) getting along with mother/mother figure?
3) getting along with father/father figure?
4) feeling unhappy or sad?

How much of a problem would you say he/she has with:

5) his/her behavior at school or his/her job?
6) having fun?
7) getting along with adults other than parents/parent figures?

How much of a problem does he/she have with:

8) feeling nervous or afraid?
9) getting along with his/her brother or sister?
10) getting along with other kids his/her age?

How much of a problem would you say he/she has with:

11) getting involved in activities like sports or hobbies?
12) with his/her schoolwork or doing his/her job?
13) with his/her behavior at home?

Source: Bird HR, Andrews H, Schwab-Stone M, et al. Global Measures of Impairment for Epidemiologic and Clinical Use With Children and Adolescents. *International Journal of Methods In Psychiatric Research*.1996; 6: 295-307.

With each question given a numerical answer from 0-4, we computed a summary score of 0 to 52 for each respondent. When an individual item was inapplicable or missing (e.g., the child's mother has passed away), the mean CIS score of the remaining items was used in its place. If there were four or more missing items in the scale, the variable was set to missing and dropped from the analysis. For analytic purposes, we use the threshold of 16 or above identified

responded to another diagnostic instrument and the authors did not assess whether this sequence influenced resulting CIS scores. See Bird et al., 1996.

by Bird et al[41] to identify children with "likely impairment." Based on the distribution of the data, we also classified a sub-acute group of children with CIS scores in the top quartile, with CIS scores of 9 to less than 16, as having a "possible impairment." The remaining children with CIS scores below 9 were classified as not having a functional impairment.

To identify additional factors known to influence diagnosis and treatment of mental health problems, we relied on a conceptual model of sociodemographic characteristics influencing ADHD diagnosis.[42] These covariates include age, sex, insurance status, region, and race/Hispanic ethnicity.

Analyses

We conducted the statistical analyses with SAS version 9.2 software.[43] To address our research questions, we used both bivariate and multivariate analytic methods. We weighted the data using the person weights provided with the MEPS. To correct for the complex sampling design, we used appropriate statistical procedures that adjust for clustering in SAS (e.g., surveyfreq, surveymeans, and surveylogistic). Respondents with non-positive person weights were excluded from the analysis. For the pooled years from 2002 through 2008, our sample included 49,610 children ages 5-17. The analysis was restricted to these ages because the MEPS directs the Columbia Impairment Scale questions to parents of children in this age range.

FINDINGS

Sample Characteristics

Rural children are significantly more likely than urban children to have a possible or likely mental health impairment based on the CIS (29.8% vs. 24.8%, $p<<0.01$) (Table 1). As

noted in previous studies, rural children are more likely than urban to live in households with income below 200% of the federal poverty level (44.8% vs. 36.4%; $p<0.01$) and are also more likely to have public insurance coverage such as Medicaid or SCHIP than their urban peers (36.9% vs. 29.0%; $p<0.01$). Approximately three-quarters (75.2%) of rural children are white and not Hispanic compared to slightly more than half (55.3%) of urban children. Rural mothers tend to have lower educational attainment compared to urban mothers; only 19.2% of rural children have mothers with a college degree compared to 28% of urban children in the MEPS sample. Rural children are significantly more likely to live in the South and Midwest than their urban counterparts. Rural and urban children are evenly distributed by age, sex, number of children in the household, and family structure.

Bivariate Results: Mental Health Diagnosis and Treatment

Among U.S. children ages 5-17, 9.6% had some type of psychiatric diagnosis based on claims data during 2002-08 (Table 2). The rate of psychiatric diagnosis does not differ by rural-urban residence; however, the rate of ADHD diagnosis is slightly but significantly higher among rural children than urban (6.2% vs. 5.1%; $p<0.05$). Regardless of residence, children are more likely to receive a mental health prescription (6.6%) than they are to receive counseling (4.1%). Rural children are more likely to receive any type of mental health prescription and to receive stimulants specifically compared to urban children. For example, 8.0% of rural children receive any mental health prescription compared to 6.4% of urban children ($p<0.01$).

We repeated this analysis using the CIS to compare children with possible and likely mental health impairments against children with a formal mental health diagnosis identified through claims data. For our purposes, CIS responses within MEPS are useful in identifying all children with functional mental health impairment, rather than only those children who received

treatment. Since diagnosis is likely to occur at the onset of treatment, it is a poor indicator of unmet need. The CIS, developed as a non-clinician tool with its impairment measures validated against clinician assessment,[41] also provides more rigor in identifying children with impairment as compared with the "yes/no" question used in the national surveys cited in our background section.[1,4] Among children with likely mental health impairment, nearly 40% have claims data identifying them with some type of psychiatric diagnosis. Among those with a likely impairment, rural children are more often identified with an ADHD diagnosis than urban children (24.7% vs. 19.8%; $p<0.05$). Rural-urban differences for any psychiatric diagnoses were not significant. In contrast, among children with a possible impairment, children living in rural areas were less likely to have a diagnosis other than ADHD. Rural children may not have their mental health impairments identified until their symptoms intensify.

In keeping with their higher rates of ADHD diagnosis, rural children with a likely impairment had higher rates of stimulant use than urban children (20.1% vs. 15.4%; $p<0.05$); however, receipt of any type of mental health counseling (any visit, four or more visits, and a psychiatrist visit) did not differ by rural-urban residence. Among children with possible impairment, rural children were less likely to have at least one mental health counseling visit than urban children (4.3% vs. 6.7%; $p<0.05$).

Multivariate Results: Mental Health Diagnosis and Treatment

We used logistic regression to examine whether the differences in mental health diagnosis and treatment between urban and rural children can be explained by underlying differences in the two populations. In Tables 3 through 5, we present the unadjusted odds of rural children having each mental health diagnosis or treatment relative to urban children. The unadjusted results are analogous to the bivariate results presented in Table 2. We then adjusted

the models by entering control variables known to be associated with mental health diagnosis and treatment among children. The partially adjusted models represent the difference between urban and rural children after controls for sex, age, household income, number of children living in the household, mother-only household, the mother's education level, insurance status, and census region have been added. In Table 3, we have also added the level of mental health impairment (CIS score). The fully adjusted models add Hispanic ethnicity.

As shown in Table 3, the higher odds of ADHD diagnosis, receipt of a mental health prescription, and receipt of stimulants among rural children vanish after appropriate controls are included in the partially adjusted model. This suggests that the observed bivariate differences result from underlying differences in demographic characteristics and risk factors, such as higher rates of poverty, public coverage, and mental health impairment among rural children. In the fully adjusted model, we find that rural children are less likely to have a non-ADHD diagnosis (OR: 0.78) and less likely to receive mental health counseling (OR: 0.78) (Table 3). Compared to the partially adjusted model, the addition of Hispanic ethnicity to the model lowers the likelihood by roughly 20% that rural children will receive any psychiatric diagnosis, a diagnosis other than ADHD, or any mental health treatment when compared with urban children.

With few exceptions, the demographic and risk factors entered as control variables in the partially and fully adjusted models are significantly associated with any psychiatric diagnosis, any mental health prescription, and any mental health counseling, as demonstrated in prior research.[24,9,29,15,23] Public coverage is a strong predictor of psychotropic medication use (OR 2.6; data not shown). Significant negative predictors include female gender, minority race/ethnicity, and residence in the West.

To further explore the relationship between rural residence, level of mental health impairment, and diagnosis and treatment, we ran the same multivariate models on subpopulations of children with CIS scores suggesting likely impairment (i.e., 16 or higher), as well as possible impairment (i.e., scores between 9 and 15). Both the partially and fully adjusted models for children with likely impairment in Table 4 show no significant urban-rural differences in any of the diagnosis or treatment variables, which suggests that rural children with the highest levels of mental health need are no more or less likely to be diagnosed and/or treated for mental health conditions. However, among the possible impairment group in Table 5, we find that, in both models, rural children are less likely to be diagnosed with a psychiatric illness other than ADHD (fully adjusted OR: 0.52) and are less likely to receive mental health counseling (fully adjusted OR: 0.50). The addition of race and ethnicity to the model reduces the odds of diagnosis and any treatment among rural children as well as the odds that rural children will receive four or more mental health visits (fully adjusted OR: 0.51). Our results appear to suggest that lack of mental health diagnosis and treatment among rural children may be explained, in part, by lack of access among rural minority children. However, the decreased likelihood of diagnosis and treatment when controlling for Hispanic ethnicity is more likely explained by the significant urban-rural difference in the size of the Hispanic population as a proportion of the total population. Since Hispanics are less likely to need care,[44,45] and less likely to seek and receive care, the fact that they represent a larger portion of the urban population depresses the rate of diagnosis and treatment in urban areas. When a control is added for Hispanic ethnicity, those rates increase, relative to rural areas, where there are fewer Hispanics.

LIMITATIONS

Using MEPS as our data source had both advantages and limitations for addressing our research questions. On one hand, sampling strategies and weighting methods of the MEPS survey contribute to the generalizability of the results to rural and urban areas and populations across the nation. On the other, the MEPS collapses ICD-9 codes into 3 digits rather than 5 digits, reducing the specificity of our diagnostic categories. Also, MEPS does not survey the institutionalized population, which may represent different treatment content, and it does not permit prescription data to be linked to the type of provider who wrote the prescription. In a preliminary analysis, we examined type of psychotropic medications, but found very low prevalence (<1% for each type of drug), which limited our ability to examine rural-urban differences. Despite these limitations, MEPS remains the best source for addressing this study's aims.

We also acknowledge the possibility of measurement error in the form of respondent bias in reporting symptoms and behaviors included in the CIS questionnaire. Parents less likely to report impairments are less likely to seek care for the child, and the child is thereby less likely to receive a diagnosis. Thus, the CIS variable may be correlated with the error term in the dependent variable in regressions where the CIS score is a regressor, e.g., Table 3. However, the rigor with which parents responses to the CIS questionnaire were validated by comparing them with clinicians' responses suggests that the design of the instrument effectively minimizes bias.[§]

[§] We attempted to eliminate the correlated error term through instrumental variable methods, but were thwarted by the absence of a suitable instrument in our data set. Use of two-stage least square to create an instrument was similarly a poor fix, due to the lack of a variable strongly related to the CIS score but not related to the probability of diagnosis.

DISCUSSION AND POLICY IMPLICATIONS

We have confirmed previous findings that rural children are less likely than urban children to receive counseling as part of their treatment for mental health issues. It has been well-established that rural areas have shortages of mental health professionals, and we have often concluded that, in the absence of such specialists, both children and adults are more likely to be treated with medications that can be prescribed by primary care providers. In the case of children, however, our confounding finding is the higher rate of diagnosis and treatment for ADHD, particularly the higher rate of stimulant prescriptions, observed in rural areas. In this study, we have attempted to identify need for mental health services first by using the CIS and then investigating the rates of diagnosis, counseling and prescribing in rural and urban areas, while controlling for need and a variety of other factors known to be correlated with access to health services. We have found that the higher rate of ADHD diagnosis and stimulant prescribing in rural areas is likely a manifestation of greater need for such treatment, based on the CIS scores. We have also established that non-ADHD mental health problems are significantly less likely to be diagnosed and treated among rural children. The rural-urban difference is greatest when we direct our attention to "sub-acute" mental health issues, those children scoring in the "possible impairment" range on the CIS questions.

The mental health impairment scale we used, CIS, produces scores ranging from 0 to 52. The instrument was designed primarily to identify those with more urgent needs, by focusing on those with scores at 16 or above. Because diagnostic criteria for mental illnesses in children are less precise than those for adults, scores are not precisely correlated with diagnoses. In fact, the CIS provides a continuum of need, with higher scores indicating greater need, and lower scores indicating lesser need. The mid-range of 9-15 is unavoidably ambiguous. Children in that range

may or may not be "diagnosable" and may or may not need counseling or medication. Because the greatest urban-rural difference is observed among these low-impairment children, it is possible that this disparity does not need to be addressed. On the other hand, the lack of mental health specialty providers in rural areas means there is, in many cases, no one available to determine whether treatment is indicated.

While more specialty services are certainly needed in rural areas, we suggest that future policy interventions realistically focus on existing infrastructure in rural areas, including schools and primary care. For those resources to address the ambiguity that we have detected in our study, future research should focus on how school counselors and primary care providers might identify children in this sub-acute range, and should also identify or develop diagnostic protocols for children in this range of impairment, suitable for use by non-specialists. Parent support and training has been shown to be helpful in treating children with ADHD and other behavioral issues[46,47] and may have utility for rural children by providing indirect access to mental health professionals.

Additionally, children who are not white and/or Hispanic appear to drive lower diagnosis of non-ADHD conditions and use of counseling services in rural areas compared to urban. Underuse of mental health treatment is well-documented among Hispanic and African Americans,[48] and primary care providers are less likely to detect a mental health problem among Hispanic or African American patients compared to white patients.[49] Lack of health insurance and poverty are among the major barriers to mental health service use among minorities,[50,51,52] while language proficiency, and culturally appropriate care also play a role.[53,54] These barriers may be exacerbated in rural areas without the resources to address the special needs of small populations.

Table 1: Sociodemographic Characteristics by Urban/Rural Residence
Medical Expenditure Panel Survey 2002-2008
Children Ages 5 - 17

	Total	Urban	Rural
Sample Size	49,791	41,359	8,432
Population Estimate	53,556,150	44,564,598	8,991,552
MH Impairment (CIS Score) **			
No impairment (CIS < 9)	74.4	75.2	70.2
Possible impairment (9 - < 16)	14.1	13.7	16.2
Likely impairment (16+)	11.5	11.1	13.6
Age			
5 - 11	52.7	52.8	52.0
12 - 17	47.3	47.2	48.0
Sex			
Male	51.0	51.1	50.2
Female	49.0	48.9	49.8
Race/Hispanic Ethnicity**			
White / Not Hispanic	58.7	55.3	75.2
Not White / Not Hispanic	22.1	23.3	16.2
Hispanic	19.2	21.3	8.6
Household Poverty Status**			
< 100% FPL	16.8	16.2	19.8
100 - 199% FPL	21.0	20.2	25.0
200% FPL or higher	62.2	63.6	55.2
Number of children in HH			
One (only child)	21.4	21.3	22.3
Two or Three	63.4	63.9	61.2
Four or more	15.1	14.9	16.5
Family Structure			
Unmarried mother only	22.1	22.4	20.3
Other	77.9	77.6	79.7
Mother's Education Level**			
Less than HS	17.6	17.6	17.7
HS/GED	30.7	29.6	36.0
Some College	25.1	24.8	27.1
College degree	26.6	28.0	19.2
Insurance Status**			
Uninsured	11.9	12.1	10.9
Private Coverage	57.8	58.9	52.3
Public Coverage	30.3	29.0	36.9
Region**			
Northeast	17.5	18.8	11.1
Midwest	22.0	20.3	30.2
South	36.3	34.8	43.5
West	24.2	26.1	15.1

Difference between urban and rural residence significant at p<.05* and p<.01**

Table 2: Mental Health Diagnosis and Treatment by Rural Residence and Level of Mental Health Impairment
Medical Expenditure Panel Survey 2002 - 2008
Children Ages 5 - 17

	ALL CHILDREN n=49,791				POSSIBLE IMPAIRMENT n=6,239				LIKELY IMPAIRMENT n=5,640			
	Total	MSA	Non-MSA	Sig	Total	MSA	Non-MSA	Sig	Total	MSA	Non-MSA	Sig
Mental Health Diagnosis												
Any psychiatric diagnosis	9.6	9.6	10.1		14.9	15.6	12.4	*	36.9	36.5	38.3	
ADHD diagnosis	5.3	5.1	6.2	*	8.4	8.3	8.7		20.8	19.8	24.7	*
Other psychiatric diagnosis	5.6	5.6	5.4		8.1	8.7	5.2	**	23.9	24.1	23.1	
Mental Health Prescriptions												
Any MH prescription	6.6	6.4	8.0	**	10.1	10.1	10.1		25.6	24.9	28.4	
Any stimulants	4.1	3.9	4.8	*	6.6	6.5	6.7		16.3	15.4	20.1	*
Mental Health Counseling												
Any MH counseling (Any visit)	4.1	4.1	4.1		6.3	6.7	4.3	*	19.3	19.6	17.8	
MH treatment (4+ visits)	2.3	2.3	2.3		3.1	3.4	2.2		12.3	12.6	11.0	
Any visit with psychiatrist	2.7	2.7	2.8		4.0	4.1	3.5		13.4	13.7	12.3	
No treatment (No Rx and No Counseling)	91.6	91.8	90.4	*	86.7	86.4	88.0		68.1	68.6	66.3	

* Difference between MSA / Non-MSA is significant at p < .05 ; ** p < .01

Table 3: Odds of MH Diagnosis and Treatment for Rural (versus Urban) Children
Medical Expenditure Panel Survey 2002 - 2008

ALL CHILDREN (n=49,791)						
	Unadjusted		Partially Adjusted[a]		Fully Adjusted[b]	
	OR	95% CI	OR	95% CI	OR	95% CI
Mental Health Diagnosis						
Any psychiatric diagnosis	1.06	(0.91 , 1.24)	0.92	(0.79 , 1.08)	**0.84**	(0.72 , 0.98)
ADHD diagnosis	**1.23**	(1.02 , 1.49)	1.05	(0.86 , 1.29)	0.96	(0.79 , 1.18)
Other psychiatric diagnosis	0.97	(0.79 , 1.18)	0.87	(0.71 , 1.06)	**0.78**	(0.64 , 0.95)
Mental Health Prescriptions						
Any MH prescription	**1.27**	(1.09 , 1.49)	1.11	(0.94 , 1.31)	0.99	(0.84 , 1.18)
Any stimulants	**1.25**	(1.02 , 1.53)	1.09	(0.88 , 1.36)	0.99	(0.8 , 1.24)
Mental Health Counseling						
Any MH counseling (Any visit)	0.99	(0.79 , 1.23)	0.87	(0.7 , 1.09)	**0.78**	(0.62 , 0.98)
MH treatment (4+ visits)	1.02	(0.76 , 1.35)	0.88	(0.65 , 1.19)	0.77	(0.57 , 1.05)
Any visit with psychiatrist	1.02	(0.78 , 1.33)	0.88	(0.67 , 1.15)	0.80	(0.61 , 1.05)

[a] Adjusted for CIS score, sex, age, household income, number of children living in the household, mother-only household, mother's education level, insurance status, and region.

[b] Adds adjustments for race and Hispanic ethnicity.

Bold indicates significance at p<.05.

Table 4: Odds of MH Diagnosis and Treatment for Rural (versus Urban) Children
Medical Expenditure Panel Survey 2002 - 2008

CHILDREN WITH LIKELY IMPAIRMENT ONLY (n=5,640)						
	Unadjusted		Partially Adjusted[a]		Fully Adjusted[b]	
	OR	95% CI	OR	95% CI	OR	95% CI
Mental Health Diagnosis						
Any psychiatric diagnosis	1.08	(0.89 , 1.32)	1.05	(0.84 , 1.3)	0.97	(0.78 , 1.21)
ADHD diagnosis	**1.33**	(1.06 , 1.67)	1.17	(0.9 , 1.52)	1.09	(0.84 , 1.41)
Other psychiatric diagnosis	0.95	(0.76 , 1.17)	1.01	(0.8 , 1.28)	0.94	(0.74 , 1.19)
Mental Health Prescriptions						
Any MH prescription	1.19	(0.97 , 1.48)	1.14	(0.91 , 1.44)	1.06	(0.84 , 1.33)
Any stimulants	**1.39**	(1.08 , 1.79)	1.30	(0.98 , 1.72)	1.23	(0.92 , 1.64)
Mental Health Counseling						
Any MH counseling (Any visit)	0.89	(0.69 , 1.15)	0.94	(0.72 , 1.21)	0.86	(0.67 , 1.12)
MH treatment (4+ visits)	0.86	(0.63 , 1.16)	0.89	(0.64 , 1.23)	0.81	(0.59 , 1.12)
Any visit with psychiatrist	0.89	(0.66 , 1.21)	0.89	(0.66 , 1.21)	0.84	(0.62 , 1.13)

[a] Adjusted for sex, age, household income, number of children living in the household, mother-only household, mother's education level, insurance status, and region.

[b] Adds adjustments for race and Hispanic ethnicity.

Bold indicates significance at p<.05.

Table 5: Odds of MH Diagnosis and Treatment for Rural (versus Urban) Children
Medical Expenditure Panel Survey 2002 - 2008

CHILDREN WITH POSSIBLE IMPAIRMENT ONLY (n=6,239)						
	Unadjusted		Partially Adjusted[a]		Fully Adjusted[b]	
	OR	95% CI	OR	95% CI	OR	95% CI
Mental Health Diagnosis						
Any psychiatric diagnosis	**0.77**	(0.59 , 0.99)	**0.74**	(0.57 , 0.97)	**0.68**	(0.52 , 0.89)
ADHD diagnosis	1.05	(0.78 , 1.41)	1.01	(0.74 , 1.38)	0.92	(0.67 , 1.25)
Other psychiatric diagnosis	**0.57**	(0.38 , 0.87)	**0.56**	(0.37 , 0.85)	**0.52**	(0.34 , 0.78)
Mental Health Prescriptions						
Any MH prescription	1.01	(0.77 , 1.32)	0.95	(0.71 , 1.28)	0.87	(0.65 , 1.17)
Any stimulants	1.03	(0.73 , 1.44)	1.02	(0.71 , 1.47)	0.94	(0.66 , 1.36)
Mental Health Counseling						
Any MH counseling (Any visit)	**0.62**	(0.41 , 0.94)	**0.55**	(0.35 , 0.86)	**0.50**	(0.32 , 0.78)
MH treatment (4+ visits)	0.63	(0.37 , 1.09)	0.58	(0.32 , 1.05)	**0.51**	(0.28 , 0.93)
Any visit with psychiatrist	0.86	(0.52 , 1.4)	0.85	(0.52 , 1.39)	0.77	(0.47 , 1.27)

[a] Adjusted for sex, age, household income, number of children living in the household, mother-only household, mother's education level, insurance status, and region.

[b] Adds adjustments for race and Hispanic ethnicity.

Bold indicates significance at p<.05.

APPENDIX: SELECTED ICD–9 CODES FROM THE MEPS CONDITION FILE

290 – 293 ORGANIC PSYCHOTIC CONDITIONS

294 OTHER ORGANIC PSYCHOTIC CONDITIONS

295 SCHIZOPHRENIC DISORDERS

296 AFFECTIVE PSYCHOSES

297 PARANOID STATES

298 OTHER NONORGANIC PSYCHOSES

299 PERVASIVE DEVELOPMENTAL DISORDERS

300 NEUROTIC DISORDERS

301 PERSONALITY DISORDERS

302 SEXUAL DISORDERS

303 ALCOHOL DEPENDENCE SYNDROME

304 DRUG DEPENDENCE

305 NONDEPENDENT DRUG ABUSE

306 PSYCHOPHYSIOLOGIC DISORDER

307 SPECIAL SYMPTOMS NOT ELSEWHERE CLASSIFIED

308 ACUTE REACTION TO STRESS

309 ADJUSTMENT REACTION

310 NONPSYCHOTIC BRAIN SYND

311 DEPRESSIVE DISORDER NOT ELSEWHERE CLASSIFIED

312 CONDUCT DISTURBANCE NOT ELSEWHERE CLASSIFIED

313 EMOTIONAL DISTURBANCE SPECIFIC TO CHILDHOOD/ADOLESCENCE

314 HYPERKINETIC SYNDROME

315 SPECIFIC DEVELOPMENTAL DELAYS

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Established in 1992, the Maine Rural Health Research Center draws on the multidisciplinary faculty, research resources and capacity of the Cutler Institute for Health and Social Policy within the Edmund S. Muskie School of Public Service, University of Southern Maine. Rural health is one of the primary areas of research and policy analysis within the Institute, and builds on the Institute's strong record of research, policy analysis, and policy development.

The mission of the Maine Rural Health Research Center is to inform health care policymaking and the delivery of rural health services through high quality, policy relevant research, policy analysis and technical assistance on rural health issues of regional and national significance. The Center is committed to enhancing policymaking and improving the delivery and financing of rural health services by effectively linking its research to the policy development process through appropriate dissemination strategies. The Center's portfolio of rural health services research addresses critical, policy relevant issues in health care access and financing, rural hospitals, primary care and behavioral health. The Center's core funding from the federal Office of Rural Health Policy is targeted to behavioral health.

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