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# Geographic Variation and Disparity in Stimulant Treatment of Adults and Children in the United States in 2008

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## Abstract

**Objective—**This study estimated the prevalence of stimulant treatment among both adults and children at national, state, and county levels during 2008 and explored explanations for wide variations in treatment prevalence.

**Methods—**Records of 24.1 million stimulant prescriptions dispensed to insured and uninsured patients were obtained from approximately 76% of U.S. retail pharmacies. Data were weighted to estimate treatment prevalence on March 15, 2008, for all U.S. states and counties. Regression models were used to estimate the associations among the counties' treatment rates and the characteristics of the counties and their resident populations.

**Results—**An estimated 2.5% of children ≤17 years of age (3.5% of males and 1.5% of females) and .6% of persons >17 years of age were being treated with stimulants in March 2008. Treatment prevalence among states varied widely, and variation among counties was even wider. Two-thirds of the variation among counties in treatment prevalence was associated with supply of physicians, socioeconomic composition of the population, and, among children, funding for special education. Rates of children and adults in treatment were highly correlated.

**Conclusions—**Wide variations in treatment prevalence signal disparities between established clinical practice guidelines and actual practice, especially for primary care, where most patients prescribed stimulants are managed. Better education and training for physicians may improve identification and treatment, thereby reducing disparities in care for attention-deficit hyperactivity disorder and other disabling conditions.

Increasing amounts of controlled stimulant medications are being dispensed in the United States (1,2), most often to treat attention-deficit hyperactivity disorder (ADHD). They are used to a lesser extent as a treatment for weight loss, narcolepsy, and mild cognitive impairments and as an adjuvant in depression treatment.

In the United States, ADHD is estimated to affect 5% to 10% of children (3,4) and 2.9% to 5.2% of adults (5-8) and is often treated with stimulant medication. Comparisons at the state level of rates of pediatric stimulant treatment have reported wide variations, suggestive of undesirable disparities in identification and treatment. A nationwide survey in 2003 by the

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Centers for Disease Control and Prevention (CDC) estimated that statewide rates of ADHD among children ranged from 5.0% to 11.1% and that treatment rates varied between 2.2% and 6.5% (9). Wide variation in pediatric treatment rates has been reported within single states (10-12), among states (9,13,14), among different regions of the United States (15,16), and among counties (17,18). The only study (14) of adult treatment rates, derived from a sample of insurance claims, estimated that .8% of adults used ADHD medications, but the extent and nature of geographic variation in adult treatment have not been examined.

ADHD is associated with heightened risks of poor academic and lifelong vocational achievement, delinquency, and other comorbidities (19). Because stimulant treatment is effective in moderating these risks (20), geographic differences in identifying and treating the disorder that do not result from differences in prevalence of ADHD or other conditions treatable with stimulants are reasons for concern.

Studies of geographic variation in use of prescribed stimulants have found correlations with a number of contextual characteristics, including supply of physicians, average age of physicians, school characteristics, and characteristics of the county's population, such as age and gender distributions, per capita income and employment rates, education levels, household structure, racial-ethnic composition, insurance coverage, lead exposure levels, and even proximity of child's residence to airports or parks (11,15,17,18). Two studies of county-level variation nationwide exist but only measure amounts of stimulants distributed per county resident (18) or amounts per estimated numbers of ADHD-diagnosed children (17) and not prevalence of treated patients.

Our study estimated the prevalence of stimulant treatment among both adults and children at national, state, and county levels. In contrast to earlier studies, our study used a large sample of prescriptions for stimulants dispensed during one year (2008) by retail pharmacies to unique patients, insured and uninsured. Regression analysis was used to estimate the extent to which various ecological differences in resident populations, supply of physicians, funding for special education services in schools, and prescription monitoring requirements accounted for county differences in treatment prevalence.

## Methods

We obtained records from IMS Health for 24.1 million prescriptions for schedule II stimulants dispensed nationwide during 2008, including prescriptions for methylphenidate, dexmethylphenidate, dextroamphetamine, combined dextroamphetamine and amphetamine, and lisdexamfetamine. These were written by 300,795 prescribers to 6,031,622 unique patients and included commercially insured, Medicaid, and cash purchases. Non-stimulants prescribed for ADHD, such as atomoxetine, were not included. Diagnostic information was not available, so we did not know the condition for which the drug was prescribed.

Retail pharmacies dispensed 97% of all stimulants sold in the United States during 2008 (21); the sample included all stimulant prescriptions dispensed that year by approximately 37,000 retail pharmacies, about 76% of all pharmacies in the United States. IMS used a HIPAA-compliant procedure to match and link all prescriptions dispensed by any pharmacy in its network to unique patients, thereby enabling analyses of prescriptions to unique individuals. Prescribers' specialty and office location were obtained from American Medical Association (AMA) files. Abt Associates' Institutional Review Board approved this study; patients' consent was not required because research involved secondary analysis of deidentified patient data.

National estimates of prescriptions for these stimulants were developed by weighting each of the 24.1 million prescriptions in the sample. Because participation in the IMS reporting network varies by region, IMS estimates, for each drug product, the ratio of reporting pharmacies' sales in each zip code to total sales of that product by retail pharmacies in that zip code. IMS derives estimates of the latter amount by using information from manufacturers and distributors about sales to all pharmacies in each zip code. We aggregated these ratios to the level of the first three zip code digits ("ZIP3") and used them to weight the sample prescription data to estimate the total number of prescriptions for each pharmaceutical product dispensed by all retail pharmacies in each ZIP3 area. These coverage ratios were used to estimate the total number of unique patients in the U.S. population by counting the number of pharmacies used by each patient in the sample and then assigning person weights that were the inverse of the probability that patients in the population with exactly that number of pharmacies would be observed in the sample population.

Rather than count any use of stimulants, which would encompass trial use for diagnostic purposes, treatment was defined as sustained use of stimulants. Use of nonstimulant medications or psychosocial treatments was not included for lack of data. To develop the point prevalence estimate of stimulant treatment, patients who had an active prescription on March 15, 2008, and had purchased at least 60 days' supply of stimulants during the first half of 2008 were classified as being treated. An "active prescription" meant that the days' supply after the purchase date encompassed March 15. We selected this date because medication is more prevalent among children in the winter (22), probably because school performance is sometimes a factor in identifying behavioral disorders. Estimates for March were considered indicative of prevalence during 2008.

Using this definition of treatment, point prevalence rates per 1,000 county residents on March 15, 2008, were derived by using 2008 county population estimates from the U.S. Census Bureau. Patients' addresses were unavailable, so the county in which the prescribing physician practiced was used for location. County location of prescribers' offices was obtained from the AMA's Physician Professional Data, 2008. Because prevalence was higher among males than females, and higher among children than adults, county and state prevalence rates were standardized by age and gender to eliminate the effects of different age and gender distributions of resident populations in states and counties. Data were partitioned into separate files for children 17 years of age or younger and adults over 17.

Multivariate statistical models (ordinary least-squares regression models) were used to estimate the extent to which rates of treatment standardized by age and gender were associated with several ecological characteristics of counties. These characteristics included, among others, indicators of physician availability, poverty, household income inequality (measured by Gini coefficient) (23), education, and race-ethnicity. Availability of prescribers in the county was obtained from the AMA Physician Master File for 2007. Poverty was computed as the average number of two separate measures—food stamp recipients per 1,000 residents for 2006 (24) and persons in poverty per 1,000 residents for 2007 (25). Data about the percentage of residents living in urban areas as well as information about race-ethnicity were measured by the U.S. Census Bureau. Race-ethnicity has been correlated with access to care (26) and with the prevalence of ADHD (3,5). Information about Medicaid eligibility of county residents (27), county residents without insurance (27), and per-pupil spending for special education programs in county schools (28) was also collected.

All characteristics were measured either as percentages or as rates per 1,000 county residents standardized by age and gender. If measures were not available for 2008, we used data for the closest year. All county and state attributes were considered ecological characteristics and not characteristics of patients who were prescribed stimulants during 2008.

## Results

An estimated 4.5% of children and 1.2% of adults purchased at least one stimulant prescription during the first half of 2008, but only half of them (2.5% of children and .6% of adults) were classified according to our measure as being in treatment. Wide variation in treatment prevalence existed among states, among both children and adults (Figures 1 and 2). Alaska and Delaware had the lowest and the highest rates, respectively, of both children and adults in treatment. State rates of adults and children in treatment were highly correlated (r=.7). Among children, rates ranged between .4% and 5.1%, a 14-fold difference. For adults, the difference was sixfold, from .2% in Alaska to 1.2% in Delaware.

There were small differences in regional treatment rates—the rates among children were slightly higher in the South (2.4%) and were lowest in the Midwest (2.2%). Regional rates for adults were highest in the South (.5%) and were .4% elsewhere. Within regions, however, rates differed significantly. In Maryland, for example, 2.7% of children were estimated to have been in treatment, compared with 5.1% in neighboring Delaware, 3.6% in West Virginia, and 4.4% in Kentucky.

Treatment prevalence varied even more widely among counties. Table 1 shows the ranges in prevalence among states and counties, by age and gender of patients. The extent of variation is indicated by the ratios of treatment rates for the 75th and 25th percentiles in the rankings of states and counties and by the coefficients of variation (COVs), calculated as the standard deviation from the mean county rate divided by the mean of that rate. Among children, for example, the county treatment rate for the 75$^{th}$ percentile was 4.6 times higher than the rate for counties in the 25$^{th}$ percentile. Among states, the equivalent ratio was lower: 2.0. The COV was larger among counties than among states: .97 for children and 1.01 for adults, compared with .42 and .39, respectively.

Some of this geographic variation in treatment prevalence was attributable to measured socioeconomic differences in the resident populations. Tables 2 and 3 show the estimated contribution of these measured ecological characteristics to the observed county variation in treatment prevalence among children and adults. Each table includes three models of treatment prevalence. Model 1 omits variables for the geographic region and state, model 2 includes variables for geographic region, and model 3 substitutes state variables, treated as fixed effects, for regional variables. [Coefficients for each of the dummy state variables in model 3 are available online as a data supplement to this article.]

Variables in model 1, which excluded any reference to geography, accounted for 60% and 61% of the observed variation among counties in treatment prevalence among children and adults, respectively, indicated by the model $R^2$. Adding information about region in model 2 did not change the model $R^2$. After controlling for the various measured difference among counties, treatment prevalence among children and adults was lower in the Midwest and South, relative to the Northeast, and was highest in the West. Substituting state variables for region variables improved the predictive power of the models slightly and the amount of variance accounted for by the models ($R^2$=.64 for children and $R^2$=.65 for adults).

Rates of children in treatment were positively correlated with the county supply of pediatricians and, to a lesser extent, of family medicine practitioners (Table 2, model 3). (Only 34% of children in treatment obtained any of their prescriptions from a psychiatrist, and 4% obtained any from a neurologist; nearly all others got them from primary care providers.) Child treatment prevalence was higher in more urban counties and in counties with larger proportions of non-Hispanic white residents, less educated populations, higher poverty rates, higher average expenditures for special education programs in schools, and higher prevalence of adults in treatment.

Ecological characteristics associated with higher prevalence of adult treatment differed somewhat (Table 3, model 3). Adult treatment prevalence was correlated with physician supply, but of psychiatrists and family medicine practitioners rather than of pediatricians. (Among adults in treatment, 44% obtained one or more prescriptions from a psychiatrist, and 4% obtained them from a neurologist.) Prevalence was positively correlated with percentage of residents living in urban areas and with higher education, lower poverty rates but larger proportions of residents without insurance, smaller percentages of non-Hispanic white residents, and greater income inequality. Living in states with prescription monitoring programs was not correlated with treatment rates of adults or children.

County prevalence rates of any stimulant use were highly correlated with rates of treatment among both children (r=.87, p=.000) and adults (r=.89, p=.000). Variation among counties in prevalence of any use of stimulants, therefore, tracked treatment prevalence closely.

## Discussion

Where one lives matters greatly for the likelihood of being treated with stimulants. We found wide variation among counties in prevalence of stimulant treatment for children (COV=.97) and adults (COV=1.01). These are much higher COVs than reported for most other types of medical practice. Among elderly Medicare beneficiaries nationwide during 2007, for example, the COV was .08 for drug spending per beneficiary at the level of hospital referral region (29). During 2004, the COV was .123 for total state-level health care spending per capita in the United States and .11 for Medicare spending per beneficiary (30). Our companion study of county variation in opioid prescribing, however, found wide variation in COV statistics depending upon the type of opioid—between 1.06 and 4.21. This variation was similar to the variation reported here (31).

Our national estimates of treatment prevalence were generally consistent with findings of other studies of treatment and use. One study estimated that during 2001–2004, 2.8% of children used stimulants “during most of the previous year” (3), which was nearly identical to our estimate of sustained treatment in 2008 (2.5%). Our estimate of the proportion of children prescribed any amount of stimulants (4.5%) was in the same range (3.4%--4.3%) reported in five other studies that estimated any use (2,3,13,14). The CDC’s estimate in 2003 of pediatric treatment prevalence for children diagnosed as having ADHD (4.3%) was higher than ours (2.5%) but used a much broader definition of treatment: the use of any medication, including nonstimulants (9). The only estimate of adult prevalence available in the published literature for comparison (.8% of adults in 2005) was based on commercial insurance claims and defined treatment as at least one stimulant prescription that year (14), a lower standard than the point prevalence estimate used in this study (1.2%).

Any sampling errors in our estimates would have been small because of the large sample size, but some nonsampling errors may have existed. Online pharmacies, and some mass merchandisers do not report to IMS Health. In areas where patients rely disproportionately on these channels, treatment prevalence may be underestimated, but only slightly.

What explains this geographic variation in treatment? It is unlikely that the observed variation in treatment prevalence among states and counties stemmed from wide geographic differences in prevalence of ADHD and other conditions for which stimulants are prescribed. Estimates of ADHD prevalence using diagnostic instruments are available only at national and regional levels because survey samples for smaller areas are too small to yield precise estimates (3,5,6). Existing research on the correlates of ADHD provides no basis for suspecting that the prevalence of ADHD varies by locale to the same extent as treatment prevalence. Although there is some evidence that ADHD prevalence may vary by race-ethnicity (5)—which, by extension, may contribute to geographic variation in treatment—considerable residual variation in treatment prevalence remained even after we included the racial-ethnic composition of the county population in our statistical models.

A more likely explanation is that decisions to treat vary widely. A significant proportion of both children and adults who meet criteria for ADHD diagnosis are not treated with stimulants (3,5,9,14). Reported estimates of ADHD prevalence among children (5%–10%) (3,4,9) and adults (2.9%–5.2%) (5-8) are higher than our estimates of treatment prevalence.

One plausible interpretation of our findings is that physicians, schools, and parents in locales where pediatric treatment rates were closer to the estimated national ADHD prevalence rates are more effective in identifying, diagnosing, and treating ADHD and, perhaps to a lesser extent, other conditions for which stimulants are indicated. The strongest predictor of treatment was the availability of physicians in the area—a common finding in studies of geographic variations among other types of medical treatment (32). Expenditures per pupil for special education were positively correlated with treatment. The high correlation between adult and child treatment prevalence may indicate that having a child who has been identified as having ADHD is a pathway into treatment for adults, given that ADHD is a neurodevelopmental disorder (33,34), although the correlation may have resulted in part from the aging into adulthood of persons identified during childhood as having ADHD. Parents' willingness to accept stimulant treatments for their children may also vary geographically, reflecting different beliefs and values about medical treatment of behavioral disorders.

Lacking clinical information about persons in treatment, we were unable to test these hypotheses. However, studies of community prevalence of stimulant treatment suggest caution against drawing the inference that higher treatment rates indicate more accurate identification of ADHD. A study of stimulant treatment and diagnostic indicators in a representative sample of 4,500 children in 11 North Carolina counties reported "a serious mismatch between need for stimulant treatment and the provision of such treatment" (35). Children who met criteria for ADHD were not diagnosed and, conversely, a majority of those treated with stimulants did not meet those diagnostic criteria. Similar findings have been reported in studies of medical treatments generally. Wennberg (32) wrote that "much of the variation among hospital referral regions and per capita spending, resource allocation, and service use is unwarranted because it isn't explained by illness or patient preference." It is, therefore, possible that areas characterized by high treatment prevalence are also characterized by high rates of misdiagnosing and over-prescribing. This suggests that geographic variation in stimulant treatment observed in our study may have been generated to some extent by factors unrelated to patients' conditions.

Treatment rates may have been driven by supply-side forces rather than by "demand pull" only. The strong correlation between physician supply in a county and stimulant treatment prevalence may indicate that as physicians (and, by extension, treatments) become more accessible, the more their services are consumed. Another supply side force was the development and marketing of brand-name stimulants in the mid–1990s and early 2000s. Although methylphenidate and amphetamines had been used since the 1930s to treat behavioral disorders and other conditions, it was not until 1995 that a proprietary immediate-release amphetamine was introduced and marketed as treatment for ADHD. In the early 2000s, several branded immediate- and extended-release versions of methylphenidate were approved and marketed for ADHD. The prevalence of stimulant use among children under 19 increased from .9% to 2.4% between 1987 and 1996 and increased to 3.5% in 2008 (1,2). Direct marketing to physicians and consumers and the associated promotion of stimulant treatment probably played a role in encouraging use of the drugs.

The extent of geographic variation in treatment prevalence in the 1980s or early 1990s is not known, but our finding of wide geographic variation in 2008 indicated that prevalence rates probably increased more in certain places than in others. One obvious explanation is that uptake of new medical technologies, like other technologies, is uneven. Incorporation of new technologies into medical practice and the associated change in practice norms may be influenced by physicians' knowledge and training, payment structures, practice settings, and the existence of opinion leaders or enthusiasts in the local community (22,36,37). Decisions to identify and treat children for ADHD often involve not just doctors and patients but also teachers, school officials, and parents; differences in the knowledge and values of these other stakeholders may influence local rates of treatment prevalence. One study of treatment decisions found that parents' agreement with physicians' diagnoses and recommendations were stronger predictors of stimulant treatment than physicians' training, practice structure, and payment or insurance structures (22).

## Conclusions

National prevalence of stimulant treatment was far below estimated prevalence of ADHD and lower still than prevalence of all combined conditions treatable with stimulants, and prevalence varied widely by geographic area. Our findings signal wide disparities between established clinical practice guidelines and actual practice, especially in primary care, where most patients prescribed stimulants are treated (38). Improved education and training for physicians may improve identification and treatment of persons with ADHD, thereby reducing disparities in care for this disabling condition.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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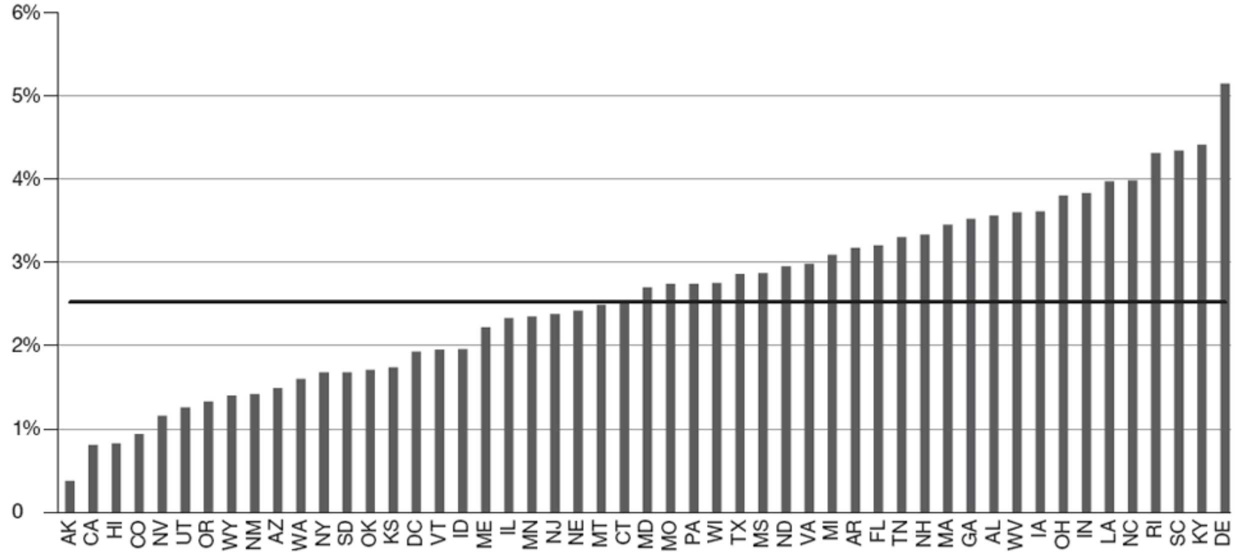


**Figure 1.**

Percentage of children ≤17 years old treated with stimulants in 2008, by state[a]

[a]Data are standardized by age and gender. The bold horizontal line indicates average national treatment rate.

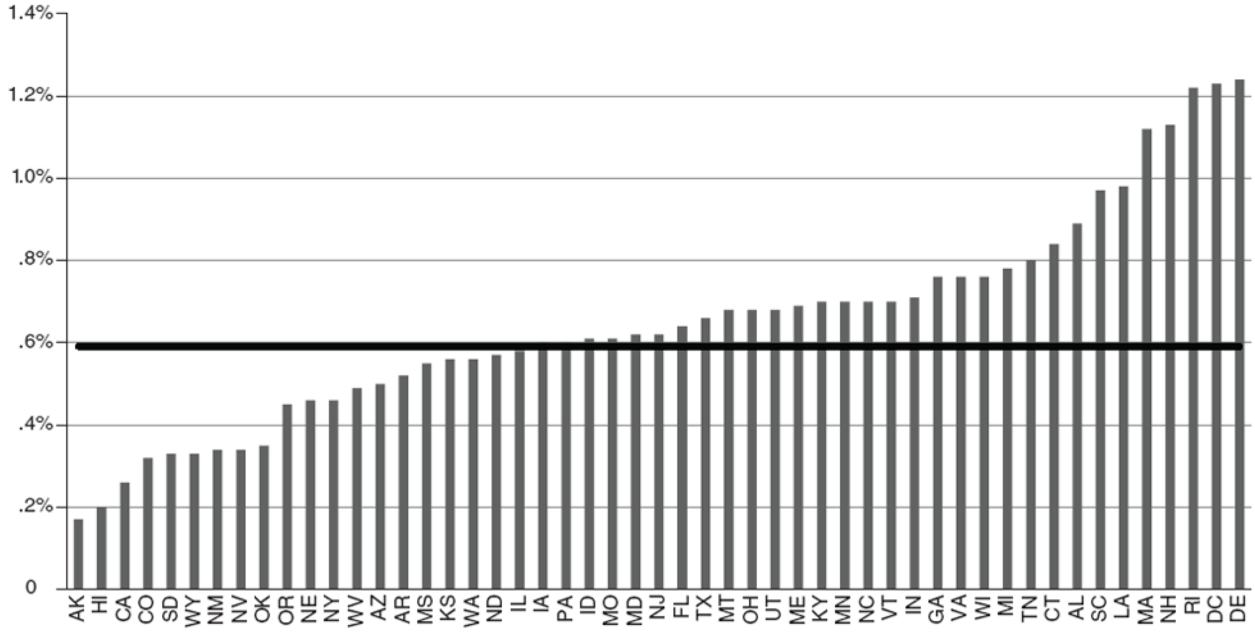


**Figure 2.**

Percentage of adults >17 years old treated with stimulants in 2008, by state[a]

[a]Data are standardized by age and gender. The bold horizontal line indicates average national treatment rate.

## Table 1

Variation among states and counties in percentages of children and adults treated with stimulant drugs in March 2008[a]

| State or county | Percentile Lowest | 25th | 50th | 75th | Ratio of 75th:25th percentiles | Mean | COV[b] |
|---|---|---|---|---|---|---|---|
| States | | | | | | | |
| Children (≤17 years) | .4 | 1.7 | 2.7 | 3.4 | 2.0 | 2.6 | .42 |
| Male | .5 | 2.4 | 3.7 | 4.7 | 2.0 | 3.6 | .41 |
| Female | .2 | 1.0 | 1.6 | 2.0 | 2.0 | 1.5 | .45 |
| Adults (>17 years) | .2 | .5 | .6 | .8 | 1.5 | .7 | .39 |
| Male | .2 | .5 | .6 | .7 | 1.5 | .6 | .40 |
| Female | .2 | .6 | .7 | .8 | 1.4 | .7 | .39 |
| Counties | | | | | | | |
| Children (≤17 years old) | <.1 | .8 | 1.8 | 3.5 | 4.6 | 2.5 | .97 |
| Male | .1 | 1.1 | 2.6 | 4.9 | 4.3 | 3.5 | .96 |
| Female | <.1 | .5 | 1.1 | 2.2 | 4.3 | 1.6 | .93 |
| Adults (>17 years old) | <.1 | .5 | .3 | .6 | 4.4 | .5 | 1.01 |
| Male | <.1 | .2 | .3 | .6 | 4.1 | .4 | 1.00 |
| Female | .1 | .2 | .3 | .7 | 4.3 | .5 | 1.00 |

[a]Percent of persons in treatment derived from LRx Data, 2008, provided by IMS Health, and from 2008 population estimates for states and counties, standardized by age and gender, from the U.S. Census Bureau

[b]Coefficient of variation

**Table 2**

Association of pediatric stimulant treatment rates in U.S. counties and county characteristics[a]

| County characteristic | Model 1[b] Coefficient | Model 1[b] SE | Model 2[c] Coefficient | Model 2[c] SE | Model 3[d] Coefficient | Model 3[d] SE |
|---|---|---|---|---|---|---|
| Population size | .08* | .03 | .08** | .03 | .09** | .03 |
| Proportion of residents in urban areas | 1.10*** | .14 | 1.16*** | .14 | 1.11*** | .15 |
| Race-ethnicity (reference: Asian) | | | | | | |
| Proportion non-Hispanic white | 3.02*** | .39 | 3.01*** | .39 | 2.20*** | .46 |
| Proportion Hispanic | .01 | .48 | −.15 | .48 | −.17 | .56 |
| Proportion African American | 1.64*** | .42 | 1.62*** | .42 | .55 | .50 |
| Education (reference: less than high school)[e] | | | | | | |
| Proportion with high school diploma | −3.87*** | .58 | −4.19*** | .58 | −2.28*** | .63 |
| Proportion with college degree | −4.14*** | .54 | −4.45*** | .54 | −2.56*** | .59 |
| Poverty rate | .01*** | .00 | .01*** | .00 | .01*** | .00 |
| Household income inequality | 1.37 | 1.05 | 1.19 | 1.05 | 1.60 | 1.05 |
| Proportion of residents <21 years old eligible for Medicaid | −1.53** | .54 | −1.66** | .54 | .54 | .67 |
| Proportion with no insurance | −1.06 | .65 | −.79 | .65 | .42 | .91 |
| Prevalence of adult stimulant treatment | 2.90*** | .08 | 2.90*** | .08 | 2.83*** | .08 |
| Special education spending | −.07 | .08 | .02 | .09 | .51** | .20 |
| Prescription drug monitoring program in state | .12* | .06 | .05 | .06 | .51 | .28 |
| Prescribers per 1,000 residents | | | | | | |
| Active physicians | −.05*** | .01 | −.05*** | .01 | −.05*** | .01 |
| Pediatricians | 6.26*** | .36 | 6.36*** | .36 | 6.11*** | .35 |
| Psychiatrists | −.39 | .48 | −.34 | .48 | −.07 | .48 |
| Family medicine specialists | .20 | .13 | .15 | .13 | .38** | .07 |
| Region (reference: Northeast) | | | | | | |
| Midwest | | | −.29** | .09 | | |
| West | | | .18* | .08 | | |

| | Model 1[b] | | Model 2[c] | | Model 3[d] | |
|---|---|---|---|---|---|---|
| **County characteristic** | **Coefficient** | **SE** | **Coefficient** | **SE** | **Coefficient** | **SE** |
| South | | | −.18* | .08 | | |

[a]Treatment prevalence, standardized by age and gender, was calculated as the number of children per 1,000 county residents who had an active prescription on March 15, 2008, and had purchased at least 60 days' supply of stimulants during the first half of 2008.

[b]$R^2$=.602, df=18, constant=−.497 (.76)

[c]$R^2$=.606, df=21, constant=−.193 (.77)

[d]$R^2$=.641, df=66, constant=−2.062 (.83), p<.05. The coefficients for states are available online as a data supplement to this article.

[e]Mean values for education were imputed for counties with missing data (N=674).

*p<.05,

**p<.01,

***p<.001

## Table 3

Association of stimulant treatment rates among adults in U.S. counties and county characteristics[a]

| County characteristic | Model 1[b] | | Model 2[c] | | Model 3[d] | |
|---|---|---|---|---|---|---|
| | Coefficient | SE | Coefficient | SE | Coefficient | SE |
| Population size | −.01 | .01 | −.01 | .01 | −.01 | .01 |
| Proportion of residents in urban areas | .09*** | .03 | .09** | .03 | .14*** | .03 |
| Education (reference: less than high school)[e] | | | | | | |
| Proportion with high school diploma | .96*** | .11 | .99*** | .11 | .99*** | .12 |
| Proportion with college degree | .93*** | .10 | .96*** | .10 | .98*** | .11 |
| Race-ethnicity (reference: Asian) | | | | | | |
| Proportion non-Hispanic white | −.10 | .07 | −.10 | .07 | −.35*** | .09 |
| Proportion Hispanic | −.09 | .09 | −.08 | .09 | −.22* | .11 |
| Proportion African American | .22** | .08 | .22** | .08 | −.12 | .09 |
| Poverty rate | −.00*** | .00 | −.00*** | .00 | −.00*** | .00 |
| Household income inequality | .62** | .20 | .61** | .20 | .59** | .20 |
| Proportion of residents <21 years old eligible for Medicaid | −.03 | .10 | −.02 | .10 | −.21 | .13 |
| Proportion with no insurance | .07 | .12 | .04 | .12 | .55** | .17 |
| Prevalence of children treated with stimulants | .10*** | .00 | .10*** | .00 | .10*** | .00 |
| Special education spending | −.04** | .02 | −.05** | .02 | .07 | .04 |
| Prescription drug monitoring program in state | −.03** | .01 | −.03* | .01 | .04 | .05 |
| Prescribers per 1,000 residents | | | | | | |
| Active physicians | .00* | .00 | .00* | .00 | .00** | .00 |
| Pediatricians | .13 | .07 | .11 | .07 | .05 | .07 |
| Psychiatrists | .63*** | .09 | .63*** | .09 | .60*** | .09 |
| Family medicine specialists | .10*** | .02 | .11*** | .02 | .10*** | .02 |
| Region (reference: Northeast) | | | | | | |
| Midwest | | | .01 | .02 | | |
| West | | | −.05** | .02 | | |

| | Model 1[b] | | Model 2[c] | | Model 3[d] | |
|---|---|---|---|---|---|---|
| County characteristic | Coefficient | SE | Coefficient | SE | Coefficient | SE |
| South | | | .01 | .01 | | |

[a] Treatment prevalence, standardized by age and gender, was calculated as the number of adults per 1,000 county residents who had an active prescription on March 15, 2008, and had purchased at least 60 days' supply of stimulants during the first half of 2008.

[b] $R^2$=.606, df=18, constant=–.708 (.14), $p<.001$

[c] $R^2$=.608, df=21, constant=–.721 (.14), $p<.001$

[d] $R^2$=.650, df=66, constant=–.432 (.18), $p<.01$. The coefficients for states are available online as a data supplement to this article.

[e] Mean values for education were imputed for counties with missing data (N=674).

* $p<.05$,

** $p<.01$,

*** $p<.001$