



The geography of antidepressant, antipsychotic, and stimulant utilization in the United States [☆]

Marissa King ^{a,*}, Connor Essick ^b

^a Yale School of Management, 135 Prospect Street, New Haven, CT 06511, USA

^b Yale School of Public Health, 60 College Street, PO Box 208034, New Haven, CT 06520, USA

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ABSTRACT

This paper analyzes local and regional geographic variability in the use of antidepressant, antipsychotic and stimulant medications in the United States. Using a data set that covers 60% of prescriptions written in the United States, we find that use of antidepressants in three digit postal codes ranged from less than 1% of residents to more than 40% residents. Stimulant and antipsychotic use exhibited similar levels of local geographic variability. A Kulldorf Spatial Scan identified clusters of elevated use of antidepressants (RR 1.46; $p < 0.001$), antipsychotics (RR 1.42; $p < 0.001$), and stimulants (RR 1.77; $p < 0.001$). Using a multilevel model, we find that access to health care, insurance coverage and pharmaceutical marketing efforts explain much of the geographic variation in use.

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1. Introduction

Mental health medications are currently among the best selling and most commonly used classes of medications in the United States. In 2010, sales of antidepressant, antipsychotic, and stimulant medications accounted for 11.4% of total U.S. spending on pharmaceuticals and grossed close to \$35 billion dollars (IMS Health Incorporated, 2010). Given the dramatic increase in antidepressant, antipsychotic, and stimulant use and cost, there has been growing interest in understanding patterns of utilization. While a considerable body of literature has documented trends in use by age and other demographic characteristics, relatively little is known about local geographic variation in the use of mental health medications.

To date, the majority of studies examining the geography of antidepressant, stimulant, and antipsychotic use have produced results that are inconclusive or not generalizable due to

methodological differences in population characteristics across studies. Within the literature there has also been a tendency to focus on patterns of use among children and adolescents. Adults, however, are the primary consumers of antidepressants and antipsychotics. Moreover, the vast majority of studies examine geographic variation have done so at the level of census region or state. The few local area studies that do exist have typically been restricted to local geographic variation within a limited area.

The clearest geographic pattern to emerge from existing studies is elevated use of stimulants among children and adolescents residing in the South (Olfson et al., 2002; Hoagwood et al., 2000; Cox et al., 2003). A recent study examining geographic variation in stimulant use found that children living in the South were 1.71 (99% CI; 1.28–1.87) times more likely than children living in other parts of the country to consume stimulants (Cox et al., 2003). Studies examining local level variation in the percent of children receiving at least one stimulant prescription in California and Michigan found that stimulant use varied by nine- and ten-fold, respectively (Rappley et al., 1995; Habel et al., 2005). Variation in the number of stimulant prescriptions written to children in counties in Michigan varied by close to 30-fold (Lin et al., 2005). This local variability far exceeds what has been observed between states and census regions, suggesting that further investigation into local geographic variation could be important.

Compared to stimulants, there is not a clear geographic pattern in antipsychotic use. A survey of office visits resulting in

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* Corresponding author. Tel.: +1 646 573 3290.

E-mail address: marissa.king@yale.edu (M. King).

a prescription for an antipsychotic between 1995 and 1997 found that 35.7% (95% CI: 29.5–41.9) of such visits occurred in the South, 20.7% (95% CI: 15.5–26.0) in the Midwest and 17.8% (95% CI: 12.9–22.8) in the West. A more recent study, however, found that use was significantly lower in the South and West relative to the Northeast (Wang and Farley, 2009). Thus, studies examining large-scale geographic variability in antipsychotic use are inconclusive. To our knowledge, no study has analyzed small area geographic variation in antipsychotic use. Accordingly, the relative size of local level geographic variance versus state level variation in antipsychotic use remains unknown.

Similarly, studies of the geography of antidepressant use have not produced consistent results over time or across populations. Antidepressant prescribing rates among children and adolescents in 1997 and 2002 were consistently higher in the Northeast (Olfson et al., 2002; Vitiello et al., 2006). However, a study of antidepressant use among adults conducted in 2006, found no clear regional geographic pattern in use. Utilization varied widely, however, from 18.4% of adults in Utah to 9.1% in New York (The Express Scripts Research and New Solutions Lab, 2012). A study conducted in eleven regions in California found a ratio of high use to low use of 1.6, which led the authors to question why there was little geographic variability in medication use relative to the large variability typically observed for diagnostic and surgical procedures (Dubois et al., 2002).

Geographic variability in mental health medication utilization likely arises from a complex causal web that includes the composition of the population, underlying prevalence of mental disorders, mixed opinions about the appropriateness of treatments and their efficacy, and so forth. Thus far, the literature has primarily provided possible explanations, rather than systematic investigations of factors associated with geographic variability in the use of mental health medications. In a study that examined variability in prescribing of medications commonly used to treat five conditions, including antidepressants, Dubois et al. (2002) hypothesized that geographic variability could arise for five possible reasons: financial incentives, impact of managed care, unique characteristics of their study site, study design, or pharmaceutical marketing and education efforts. Regarding factors that could affect antipsychotic prescribing it has been suggested that geographic variation may have been due to differences in physician training backgrounds and regional and state-specific policies on antipsychotic drug use (Patel et al., 2005).

Underlying prevalence may play a key role in geographic variation. Prevalence rates of depression have been found to vary by more than three-fold across states from 4.8% in North Dakota to 15.0% in Puerto Rico (CDC, 2010). Similarly, in 2007 attention deficit hyper activity disorder (ADHD) prevalence ranged from a low of 5.6% in Nevada to a high of 15.6% in North Carolina. Thus, at the state level there is considerable variability in prevalence. However, a growing body of literature has found that there is little or no variation in the prevalence of common mental disorders once the individual characteristics of residents are controlled for Weich et al. (2005), Pickett and Pearl (2001). Thus, the extent to which geographic variation in the use of mental health medications can be explained by variation in underlying prevalence, demographics, insurance coverage, and pharmaceutical marketing remains unknown.

This study examines geographic variability in prescribing of antidepressant, antipsychotic, and stimulant medications in the United States in 2008 using Andersen's behavioral model of health care utilization (Andersen, 1995) as a framework for understanding factors associated with the use of mental health medications. Andersen's original model (Andersen, 1968) emphasized the importance of predisposing factors, enabling or impeding factors, and need as determinants of health care utilization.

Consistent with Andersen's model we examine how predisposing characteristics (race and age), enabling characteristics (income, insurance status, access to care), and need (prevalence) are associated with the geography of mental health medication use. The model has been subsequently expanded to include environmental factors, characteristics of the health care delivery system, and provider characteristics (Phillips et al., 1998). Our analysis adds to existing understandings of factors associated with health care utilization by considering marketing as a possible determinant of health care utilization. The role that marketing may play in shaping conceptualizations of need, as well as treatment decisions and consequently utilization is not typically considered in the framework of health services use. By shaping patients' and physicians' knowledge about existing treatment options, as well as perceptions about the appropriateness of given treatments, marketing efforts may be an important factor in health care utilization, especially since geographic variation in clinical judgment has been associated with geographic variation in health care use in other contexts (Sirovich et al., 2008).

Our study finds that pharmaceutical marketing efforts, access to health care, and insurance coverage appear to explain much of the geographic variation in use of mental health medications. For each of the classes of mental health medications we examine, we found substantial local level geographic variability. At the level of the three-digit zip code, use of antidepressant ranged from less than 1 in 200 residents receiving a prescription for an antidepressant to more than 80 out of 200 residents. Stimulant and antipsychotic use exhibited similar levels of geographic variability. The majority of spatial variation in use of antidepressants, stimulants, and antipsychotics (psychotropic medications) occurred at the local level and yielded a consistent geographic pattern. Using a Kullordorf spatial scan, we identified regional areas of elevated risk for use of antidepressants (RR 1.46; $p < 0.001$), antipsychotics (RR 1.42; $p < 0.001$), and stimulants (RR 1.77; $p < 0.001$). While all of these areas of elevated risk largely centered on Tennessee, they differed from each other, as well as from the geographic patterns previously reported in the literature. After identifying systematic variation in the use of mental health medications, we then utilize multilevel regression analysis to examine factors at the three-digit zip code and state level that are associated with the use of all three classes of medications. Access to health care, insurance coverage and pharmaceutical marketing efforts appear to explain much of the geographic variation in use.

2. Data

Data for this study came from IMS LifeLink[®] LRx Longitudinal Prescription database, which contains de-identified individual prescriptions from approximately 33,000 retail pharmacies, food stores, independent pharmacies, as well as mass retailers. The LRx database covers over 60% of all retail prescriptions in the United States. During the analysis period, a total of 236,045,684 patients were covered by the LRx database. The subset of the data we focus on covers 24,142,989 patients who received at least one prescription for an antipsychotic, stimulant,¹ or antidepressant between January 1, 2008 and December 31, 2008. During our study period 3316,043 individuals filled at least one prescription for an antipsychotic, 5000,055 for a stimulant, and 19,239,366 for an antidepressant. We included all individuals who filled a prescription in one of these classes in our analysis, regardless of age. Both the numerators and denominators in our analyses are for the entire population. This is important since the age of a profile of

¹ Stimulants included the non-stimulant ADHD medication atomoxetine.

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