



Published in final edited form as:

J Am Acad Child Adolesc Psychiatry. 2008 August ; 47(8): 879–889. doi:10.1097/CHI.0b013e318179963c.

Longitudinal Mental Health Service and Medication Use for ADHD Among Puerto Rican Youth in Two Contexts

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Abstract

Objective—The study describes prevalence and rates of service and medication use and associated factors over time among Puerto Rican youth with Attention-Deficit Hyperactivity Disorder (ADHD).

Methods—Longitudinal data are obtained on Puerto Rican children aged 5 through 13 years in the South Bronx (SB) in New York (n=1,138) and two Metropolitan Areas in Puerto Rico (PR) (n=1,353). The DISC-4 is the diagnostic tool. Five composite measures of risk factors: negative family influences, ineffective structuring, environmental risks, child risks, and maternal acceptance are constructed to relate service patterns and medication use to demographic and risk variables.

Results—ADHD prevalence is similar in PR and SB. Overall mental health service, medication and psychostimulant use are lower in PR across three time points. The vast majority of the participants never received treatment at any time point. More environmental risks, negative child traits and lack of maternal warmth are associated with more service, even after adjusting for comorbidity. When risk variables are controlled, the effects of ADHD on service use decrease. Previous treatment is a strong predictor of subsequent treatment.

Conclusions—Rates of service and medication use are lower in PR. Context seems to be more important than ethnicity in predicting mental health service and medication use among Puerto Rican children with ADHD. Other psychiatric diagnoses and general risk variables are important correlates of services and medication use.

Keywords

epidemiology; ADHD; psychostimulant use

ADHD is one of the most common psychiatric disorders in the child and adolescent population, with reported prevalences ranging from 4 to 7% across different contexts and cultural settings (Bauermeister et al., 1994). Symptoms indicating *overactivity*, *inattention* and *impulsivity* seem to cluster together similarly in different cultural settings across the world (Bird, 2002; Ivanova et al., in press) and there is no compelling reason to believe that there are features of the syndrome unique to any culture.

The existing literature on the diagnosis and management of ADHD is inconsistent regarding the rates of medication use across different geographic locations or ethnic groups. Psychostimulants are widely recognized as the treatment of choice for ADHD (American

Academy of Child and Adolescent Psychiatry, 2007; Dulcan and Benson, 1997) and are not used in treating other childhood conditions except for rare disorders such as narcolepsy. However it has been shown that a large number of children in the community receive psychostimulants without meeting full diagnostic criteria for ADHD (Jensen et al., 1999a), albeit that such children have higher symptoms of ADHD (elevated above those of nontreated children). Although some concerns have been expressed that psychostimulants are over-prescribed, there is evidence to suggest the opposite (Goldman et al., 1998). On the other side of the argument, a number of studies report that the majority of children with ADHD do not receive psychostimulants (Jensen et al., 1999a; Rowland et al., 2002).

Some studies suggest that Hispanic populations are particularly underserved when it comes to medication use, (Center for Disease Control and Prevention, 2005; Rowland et al., 2002; Safer and Malever, 2000) but evidence for such disparities is not consistent. This may not apply to Puerto Rican children because other studies report that no significant differences exist between treatment patterns among Puerto Rican children and children in other ethnic groups (Jensen et al., 1999a; Leslie et al., 2005). In the MECA study (Lahey et al., 1996) no differences in the prescribing patterns of psycho-stimulants were noted between Puerto Rico and three other communities in the United States (Bauermeister et al., 2003). More recently, Leslie (2005) compared prescription patterns of clinic children with ADHD from two different mental health systems, one in Puerto Rico, the other in San Diego, CA. There were again, no significant site differences in medication use by site. Of more import is the fact that all three studies showed that less than 15% of children meeting diagnostic criteria for ADHD (Puerto Rican or otherwise), received medication. This is a very low rate compared with what had been previously reported by other studies in the general population (Angold et al., 2000; Center for Disease Control and Prevention, 2005; Rowland et al., 2002). One possible source of the variation in results of studies comparing Latino to non-Latino groups is that the comparisons tend to confound group membership with context. Latino attitudes toward medication might affect treatment rates, but living as a minority member in an impoverished area may also affect treatment patterns. In this report we aim to separate context from Puerto Rican ethnic identity. Through secondary analyses of existing data, we describe the rates of mental health service and medication use and the related risk factors among community-based probability samples of Puerto Rican youth in two different contexts, one in the South Bronx, NY (SB) and one in San Juan, PR (PR)

The present analyses aim to answer five main questions: (1) Are there differences in the prevalence of ADHD among Puerto Rican children in two different contexts? (2) To what extent are Puerto Rican children in the two contexts receiving medication for ADHD? (3) How do differences in context influence mental health service, medication, and psychostimulant use in children of the same ethnic background with and without ADHD? (4) What influence do risk factors have on mental health service, medication and psychostimulant use among Puerto Rican children in the two contexts? (5) To what extent does service/medication use persist over time? Our hypotheses are that prevalence will be similar, regardless of context, that a lower proportion of children in PR receive mental health services and medication, including psychostimulants, than Puerto Rican children in the SB and that an explanation for such variation in medication use would be differences in the levels of risk factors in the two situations.

METHODS

Bird et al. (2006a; 2006b; 2007) provide detailed information about the parent study's methodology and initial findings. In brief, this is an NIMH funded longitudinal study designed to assess the prevalence, associated comorbidities and correlates of disruptive behavior disorders among Puerto Rican children in two contexts: the South Bronx (SB) in New York

City (n=1,138) and the Standard Metropolitan Areas in San Juan and Caguas, Puerto Rico (PR) (n=1,353) (total n=2,491). Children aged 5 to 13 years at baseline were followed over three waves of data collection one year apart (mean 349.6 days; s.d. 54.6). Each sample is a multistage probability sample of households of the target population, and each can be weighted to represent the populations of Puerto Rican children in the SB and those in PR. A household was eligible for the study if: (1) there was at least one child residing in the household aged 5 through 13 years identified by the family as being of Puerto Rican background; and (2) at least one of the child's parents or primary caretakers also self-identified as being of Puerto Rican background. All eligible children were selected to participate up to a maximum of three children per household.

At each assessment children and their primary caretakers were interviewed in the language of their choice (English or Spanish), using the Diagnostic Interview Schedule for Children (DISC-IV) (Shaffer et al., 2000; Bravo et al., 2001) and a wide array of risk factor measures previously described by Bird et al. (2006a). The DISC was not administered to children under 10 years because the reliability of younger child informants is questionable (Breton et al., 1995; Edelbrock et al., 1985; Fallon, Jr. and Schwab-Stone, 1994; Jensen et al., 1999b; Schwab-Stone et al., 1994). All adult informants and children who were 10 years old or older were administered the DISC-IV. The following diagnoses were ascertained: Conduct Disorder and Oppositional Defiant Disorder, Attention Deficit Hyperactivity Disorder (ADHD), Major Depression, Dysthymia, Anxiety Disorders (Separation Anxiety, Panic, and Generalized Anxiety Disorders, Social Phobia and PTSD) and Substance Use Disorder.

The test-retest reliability of parent reports of ADHD using the DISC IV in English or Spanish have been reported (Bravo et al., 2001; Shaffer et al., 2000). Test-retest reliability for ADHD was acceptable (K=0.49 for the Spanish DISC-IV and K=0.60 for the English DISC-IV), representing fair to good agreement. Agreement between lay interviewer and clinician administered DISC-IV as well as with clinical judgment for the ADHD schedule has fluctuated from fair to good (Schwab-Stone et al., 1996; Ribera et al., 1996).

Procedures

Consent forms and procedures were approved by the N. Y. State Psychiatric Institute and the University of Puerto Rico Medical School Institutional Review Boards. After obtaining informed consent from the adult and assent from the youth, each informant was interviewed by separate trained lay interviewers using laptop computers. Data collection for the three-wave study spanned a period of almost four years averaging approximately one year between waves for each respondent. Retention in the three wave panel design was excellent, and has been previously reported (Bird et al., 2007).

Diagnostic Status

For the present analyses we constructed three categories of diagnostic status: (1) neither current ADHD nor ADHD-NOS, (2) current ADHD and (3) current ADHD-NOS. The ADHD-NOS category included children with inattention and/or hyperactivity-impulsivity having clinically significant impairment, but whose symptom pattern fell below the symptomatic threshold for the disorder. For ADHD-NOS, the age of onset criterion was not considered. To examine the impact of comorbid psychiatric disorders, for some of the analyses, children were subdivided into those who met criteria for one or more of the other disorders considered in the study and those with none of the diagnoses included. All diagnostic categories include impaired functioning in at least one setting.

Mental Health Service and Medication Use

At each wave, caretakers were asked about mental health service use over the past year for emotional, behavioral, alcohol or drug problems. These included inpatient, outpatient, day treatment, special education for emotionally disturbed or school counseling. Caretakers also provided the names of any medication used for problems with emotions or behavior. All psychotropic medications were recorded in the data set and classified by the first author. Of approximately thirty medications listed, five were classified as psychostimulants: two amphetamine products (Adderal and Dexedrine) and three methylphenydate preparations (Ritalin, Concerta and Focalin). Other medications consisted of SSRI's or other antidepressants, major and minor tranquilizers, mood stabilizers or anti-convulsants, and anti-hypertensives. Caretaker attitudes towards medication use were assessed through an item that asked caretakers whether they agreed or would agree to their child receiving medications prescribed for behavior problems or problems with hyperactivity or paying attention, with three response options ("Yes", "No", or "Maybe").

Risk variables

As described in detail by Bird et al (2006a), information about parenting and environmental and child-based risks were obtained at the three time points from the caretaker and from children. We considered all the risk variables included in the study, except for neighborhood and cultural factors, which are not comparable between sites. The measures were grouped in four conceptual dimensions: 1) Negative Family Influences, 2) Ineffective Structuring Variables, 3) Child Risks, 4) Environmental Risks. Data reduction analyses were carried out that led us to focus on 18 specific risk measures that have been previously described (Bird et al., 2006a) related to these domains. Below we provide the main reference source for each measure.

Negative Family Influences included family functioning (Good et al., 1979), parent social support (Thoits, 1995), religiosity (Miller et al., 1997), and if the child was in a single parent family. *Ineffective Structuring* included parental monitoring (Patterson and Stouthamer-Loeber, 1984), parental discipline (Goodman et al., 1998), and parental attitudes towards delinquency (Loeber et al., 1998). *Environmental Risks* included Exposure to Violence (Raia, 1995; Richters and Martinez, 1993), School Environment (Bird et al., 2006a), Peer Delinquency (Loeber et al., 1998), Stressful Life Events (Goodman et al., 1998; Johnson and McKutcheon, 1980) and an adaptation of the Home Environment Scale (Bradley and Caldwell, 1977). *Negative Child Characteristics* included early aggression, assessed through 6 items about aggressive behaviors at age 2–3 years (such as hitting or biting); social adjustment, ascertained by 2 questions about getting along with teachers and peers; poor academic performance, determined by the child's performance in 10 academic subjects; child talents included special skills in 6 different areas (e.g., sports, arts, etc); and peer relations (Hudson, 1992). In addition to these four summary variables, we included *Maternal Acceptance/Warmth*, based on Hudson, (1982) in our analyses. This variable did not emerge from the data reduction screen but was a key variable in cross sectional analyses reported by Bird et al (2006b). It includes items related to the child/parent relationship and to parental burden.

All risk variables retained for further analysis had Cronbach alpha values equal to or greater than 0.54. Specific values are reported in Bird et al (Bird et al., 2006a). To represent *Negative family influences*, *Ineffective structuring variables*, *Environmental risks* and *Negative child characteristics* we used regression-based factor score estimates from factor analyses of both samples combined. Across both samples, the mean of these scores was centered at zero. To make it comparable, the *Maternal acceptance/warmth* scale was standardized to have mean zero and variance one in the combined sample. The risk variables are highly correlated over the three years (median correlation of the risks variables across the three waves is 0.64 in PR

and 0.54 in the SB) and tend to represent situations that are relatively stable. For this reason, we present the risks as the average across the three waves.

Statistical Analyses

We adjusted for differences in the probability of selection due to the sample design and differences from the 2000 census in the age/gender distribution. For estimates of means, rates and correlations among variables, we used SUDAAN software (release 8) (Research Triangle Institute, 2001) to compute weighted estimates and to adjust standard errors for intraclass correlations induced by multi-stage sampling, with children nested within households and households nested within primary sampling units.

In order to make comparisons of the two sites, we adjusted for a propensity score distribution constructed using a logistic regression model that included maternal age, maternal education, and income with membership in the SB as the outcome variable. Following guidelines of Rosenbaum and Rubin (1983), we identified strata of youth in the two sites who according to the logistic model had the same predicted probability of having come from the same site. Five such propensity score strata were defined and indicators of these strata were included in the analyses to adjust for site differences.

At each wave of data, we estimate the rates of mental health service use, all psychotropic medication use and specifically psychostimulant use among the three groups of children. These analyses reveal the extent of unmet need for ADHD in particular. They are carried out separately for PR and the SB.

We developed descriptive models that relate service and medication use to demographic characteristics and risk variables to better understand the patterns of use and possible disparities over time. These models used logistic regression with three binary outcomes: service (vs. none), medication (vs. none) and psychostimulants (vs. none). Explanatory variables included child's age, gender, and diagnostic status and risk variables as defined above. Included in these variables are constructs relevant to service/medication use, including demographics, parental burden, school problems, externalizing problems, impairment and attitudes toward medication (Alegria et al., 2004; Bauermeister et al., 2003).

The data across time were included in the analysis and linear time trends were examined. To take into account dependencies among repeated measures, we used generalized estimating equations (Diggle et al., 2002) as implemented in the GENMOD procedure of SAS (SAS Institute, 2005). The same analysis was also conducted in a sub-sample that included only children with ADHD or ADHD-NOS. An additional longitudinal analysis was done to look at persistence of service/medication use. In this analysis we examined the explanatory variables after adjusting for service/medication use in the previous wave.

RESULTS

Descriptive results

The prevalences of both ADHD and ADHD-NOS (see Table 1) are similar in Puerto Rico and the South Bronx over the three waves. Mental health service use, however, is substantially lower among children in PR relative to the South Bronx across all three time points. All site differences are significant ($p < 0.001$). Service use among children with ADHD is more than twice the overall service use rate. Among those with ADHD-NOS the results are similar. There is a tendency for ADHD-NOS children to receive less service in PR than in the SB, with fewer than half in PR receiving service.

Overall rates of medication use are also significantly lower in PR relative to the SB at all three waves [(2.8%, 5.7%) Wave 1; (3.1%, 5.9%) Wave 2; (3.3%, 5.8%) Wave 3]. Among children with ADHD there are no statistically significant site differences in medication use. Despite the moderate rates of general service use among children with ADHD, the proportion of children with ADHD who receive medications is only about one in 4 in each site.

Like general service use and medication use, there is less overall use of psychostimulants in PR relative to the SB. This difference is significant in only the first two waves although the same tendency is apparent in Wave 3. Psychostimulants are the treatment of choice for children with ADHD, but relatively few of those with the diagnosis receive psychostimulants in either site. Similar findings were obtained for those with ADHD-NOS; site differences were not significant and few of those with ADHD-NOS were receiving psychostimulants. Indeed, among children with ADHD who received medication of any kind, the proportion whose prescription was for psychostimulants was as large or larger in PR than that in the SB (results not shown in table).

Table 1 also shows site differences of an important indicator of service/medication use that will be discussed in detail later, namely caretaker attitudes toward medications for their children. In SB the majority of caretakers expressed a negative attitude towards medication use whereas in PR the proportions were significantly smaller.

Multivariate models of longitudinal data

We next considered service/medication patterns across all three waves in multivariate linear models that take into account site, gender and age (centered at 10), as well as diagnostic and risk variables. These models help to estimate the relative importance of these predictor sets on service, medication and psychostimulant use in each of the sites. In Table 2 we present results from two versions of the model for each of these outcomes. The first considers only demographic and diagnostic variables, while the second adjusts for known child/family risk variables.

After adjusting for demographic variables and considering the data from all time points, the site difference in overall service use remains statistically significant ($b = -.63$, $se = 0.11$, $p < .001$). Children in the SB are 1.88 more likely to report service use than those in PR. Across both sites there was no evidence that service use varied over wave of study, but males were more likely to use service and age at baseline was related to service use in a nonlinear pattern. Children who were younger at baseline were less likely to use services but by age 10 there was little difference in the likelihood of service use with increasing age. Those with ADHD and ADHD-NOS were approximately three times more likely to use service than those with no ADHD ($b = 1.22$, $se = .18$, $p < .001$, $OR = 3.4$; $b = 1.08$, $se = .16$, $p < .001$, $OR = 2.9$), but the ADHD and ADHD-NOS groups did not differ significantly from each other. Those with another diagnosis besides ADHD also reported receiving more service, even after adjusting for comorbid ADHD ($b = 0.71$, $se = 0.17$, $OR = 2.0$). Table 2 also shows that children whose parents would consider medication use for their treatment were also more likely to receive services ($b = 0.48$, $se = .12$, $p < .001$, $OR = 1.6$).

The second multivariate model adjusted for the five risk variables in addition to the variables just reviewed. Four of these five variables were related to reported service use. Children in families with elevated *Negative Family Influence* scores were less likely to receive services ($b = -0.21$, $se = 0.07$, $p < .01$), while those exposed to elevated *Environmental Risks* ($b = 0.20$, $se = 0.05$, $p < .0001$), who themselves had elevated *Negative Child Characteristics* ($b = 0.77$, $se = 0.07$, $p < .0001$) and who had reduced *Maternal Warmth* ($b = 0.27$, $se = 0.06$, $p < .0001$) were all more likely to receive mental health services. These associations were all adjusted for ADHD diagnosis. However, it is interesting to note that the magnitudes of the associations of

ADHD and ADHD-NOS with service use were dramatically reduced when adjusting for these risk processes. After adjustment, ADHD was no longer significant ($b=0.34$, $se=.21$, ns, $OR=1.4$) and ADHD-NOS was reduced by a third ($b=0.68$, $se=.17$, $p<.001$, $OR=2.0$). The adjustment also eliminated the association of other diagnoses ($b=0.19$, $se=0.20$, ns) and reduced the difference between the sites by half ($b=-0.34$, $se=0.13$, $p<.01$, $OR=0.72$).

Next we consider multivariate models of medication use. Model 1 in Table 2 reveals substantial site ($b=-1.12$, $se=0.22$, $p<.0001$, $OR=0.33$) and gender differences ($b=-1.0$, $se=0.24$, $p<.0001$, $OR=0.37$) in medication use, with less use in PR and less use for females at both sites. There was no change over follow-up time in medication use, but there was a pattern with age at time of recruitment that resembled the pattern for overall service use. Children with ADHD ($b=0.75$, $se=0.28$, $p<.01$, $OR=2.12$) and ADHD-NOS ($b=1.13$, $se=0.30$, $p<.001$, $OR=3.10$) were more likely to receive medications, as were those with other diagnoses ($b=0.65$, $se=0.30$, $p<.05$, $OR=1.92$). Medication use was strongly related to caretakers' reports of openness to pharmaceutical treatment, both stated unequivocally ("Yes") ($b=2.33$, $se=0.26$, $p<.001$, $OR=10.28$) and ambivalently ("Maybe") ($b=0.74$, $se=0.34$, $p<.05$, $OR=2.10$). When the five child/family risk variables were adjusted in Model 2, the associations of medication use to ADHD diagnoses (ADHD: $b=0.19$, $se=0.34$, ns; ADHD-NOS: $b=0.18$, $se=.28$, ns) and to other diagnoses ($b=0.10$, $se=.32$, ns) were again reduced to non-significance. In contrast, the effects for site, gender, and caretaker attitudes toward medication were not much affected by the adjustment. Among the five risk variables that were adjusted, three were related to medication use: *Negative family influence* ($b=-0.32$, $se=0.12$, $p<.01$), *Negative Child Characteristics* ($b=0.61$, $se=0.13$, $p<.0001$) and *Lack of Maternal Warmth* ($b=0.50$, $se=0.11$, $p<.0001$). *Environmental risks*, which had been significantly related to overall service use, had no association with medication use ($b=0.09$, $se=0.10$, ns).

The final two columns of Table 2 show results for psychostimulant use (vs. no psychostimulant use). Like the results for medication use, psychostimulants are less used in PR ($b=-0.96$, $se=0.28$, $p<.001$, $OR=0.38$) and by girls ($b=-1.0$, $se=0.32$, $p<.01$, $OR=0.37$). ADHD ($b=0.80$, $se=0.37$, $p<.05$, $OR=2.23$) and ADHD-NOS ($b=0.92$, $se=.34$, $p<.01$, $OR=2.51$) are significantly related to psychostimulant use, but other diagnosis is not ($b=0.60$, $se=0.37$, ns, $OR=1.82$). Strong caretaker openness to pharmaceutical treatment is strongly related to psychostimulant use ($b=2.53$, $se=0.36$, $p<.0001$, $OR=12.55$) but ambivalent openness was not ($b=0.52$, $se=0.50$, ns, $OR=1.68$). In Model 2, Negative Family Influence ($b=-0.36$, $se=0.16$, $p<.05$), Negative Child Characteristics ($b=0.50$, $se=0.16$, $p<.01$) and Lack of Maternal Warmth ($b=0.50$, $se=0.14$, $p<.001$) were all related to psychostimulant use, but Ineffective Parent Structuring and Environmental Risks were not. When these risks were adjusted, the associations of ADHD and ADHD-NOS to psychostimulant use were reduced in magnitude and were no longer significant.

We reexamined these predictors of service and medication use in the sub-sample of children who received either the ADHD or ADHD-NOS diagnosis. These results are shown in Table 3. Overall, the patterns of results were similar to what we found in the total sample. Overall service was more likely to be provided to ADHD children in the SB than in PR, to males, to those who had comorbid disorders, and to those whose parents expressed openness to medication interventions. When individual risk variables were included, the diagnosis of a comorbid disorder no longer predicted service use. The same risk variables predict service use among ADHD children as in the total population: Exposure to environmental risks, negative child characteristics, and lack of maternal warmth made service use more likely, while negative family influences was inversely related to the likelihood of service use. Similar patterns were found for medication use. Important factors were site, gender, and caretaker attitude toward medication. Here again, comorbidity was not related to medication use once the sample is limited to those with ADHD.

The results for the ADHD subgroup were most different from the general sample for the prescription of medication in general and psychostimulants specifically. There is no evidence of a site difference in psychostimulant use, and the strongest predictor was caretaker's attitude toward medication. Medication and psychostimulant use seem to be more a function of the caretaker's attitude towards medication use than the psychiatric needs of the child. Children with ADHD whose caretakers were amenable to medication use (responding "yes" or "maybe" to their acceptance of using medications for their child's behavior problems) were 11 times more likely to receive psychostimulants or other medications than those who were adverse to this type of intervention. Among caretakers of ADHD children receiving medication, an average (over three waves) of 90.5% in P.R. and 92.0% in the Bronx were amenable to medication use ("maybe" or "yes" responses) but the same was true of fewer caretakers (65.8% in PR and 48.0% in SB) of ADHD children not receiving medications. It is evident that the caretaker's attitude towards medication use has a major bearing on whether an ADHD child receives medication.

Among the composite risk variables, only two were predictive. Those with ADHD were less likely to get psychostimulants if there was dysfunction in the family (*Negative family influences*), and they were more likely to get them if there was an impaired relationship with the caretaker (*Low maternal acceptance/warmth*). There was no indication that *Negative child characteristics* increased the likelihood that psychostimulants would be prescribed. The gender effect was diminished in this analysis, and was only significant when individual risk variables were adjusted.

Persistence of Service, Medication and Psychostimulant Use

Table 4 shows patterns of service, medication and psychostimulant use over the three waves of data in the total sample. The patterns were similar for overall service, medication use and psychostimulant use. The majority of the participants never received services or medications at any time point. Of those who did, between one fifth and one quarter reported it in all three waves. Among those who reported services or medication in some waves but not others, there were roughly equal numbers of persons that started, that moved off and that were variable. We carried out an analysis of services or medication use at waves 2 and 3 using services or medication use at the previous wave as a predictor. For all three outcomes, the previous use was a strong predictor of subsequent use (OR's > 11). The persistence of service use was not greater among those with ADHD or ADHD-NOS (Not shown on table. Results available from authors).

DISCUSSION

There were no significant differences among Puerto Rican children in the SB and in PR in the prevalence of ADHD, which falls within the range reported in studies carried out in other populations (Bird, 2002). The finding was consistent at each of the three waves of the study. Given that ADHD is considered to be a chronic disorder that is biologically determined, a similar prevalence across both sites and a prevalence comparable to that found in other settings was expected.

Overall use of mental health services is significantly lower in PR than in the SB, even after adjusting for demographic variables. This had been predicted based on previous research findings (Canino et al., 2004; Jensen et al., 1999a; Lahey et al., 1996). While arguably, language could be a barrier to mental health service use in the SB, it does not seem to be a relevant factor in the SB population studied. All of the Puerto Rican children in the SB sample and three-fourths of their caretakers chose to respond to the interviews in English, suggesting that in the SB we are dealing with a population that is fairly well assimilated. Previous studies have shown disparities in access to care and in the availability of mental health services in Puerto Rico as

compared to other communities in the mainland (Canino et al., 2004; Lahey et al., 1996). In our study, we do not have comparable data from other populations to address this issue, but our findings indicate that Puerto Rican children who live on the island are substantially less likely to receive all levels of treatment, including any mental health service, any medication or psychostimulant medication than Puerto Rican children who live in the SB. The rates of treatment with psychotropic medications in the population as a whole are half as large in PR. These differences remain after adjusting for ADHD spectrum diagnosis, other diagnoses, parental attitudes towards medication use and other risk variables. We consider that the disparity has to do with service system differences (greater availability of services in the SB) and is contrary to the notion that minority status is the determining factor, given that a larger proportion of a minority group (Puerto Ricans in the SB) are more likely to receive services than Puerto Rican children in PR (where they are a majority).

Our results also showed a service use gender disparity; at both sites males received more mental health services than females, even when controlling for psychopathology, age, caretaker attitudes and a number of psychosocial risk factors. The literature on treatment disparities based on gender has been equivocal with some studies showing boys receiving more services (Burns et al., 1995; Cabiya et al., 2006; Cohen and Hesselbart, 1993; Verhulst and van der Ende, 1997), and others not finding gender differences in service utilization (Kataoka et al., 2002).

There appears to be greater acceptance of medications for treating behavioral problems by caretakers in PR, which may be explained by the fact that unlike the US mainland, the island does not have pressure groups militating against the use of medication in children. It is rare to find negative news media or propaganda against the use of stimulants in PR. Nevertheless, in terms of medication use in the population as a whole, there is significantly lower medication use in PR (See Table 3) and the difference in psychostimulant use is suggested although not statistically significant. This finding cannot be associated to parental attitudes towards medication use since parents in PR are less adverse to the use of medication than those in the SB and it is more likely to be related to the disparities in the mental health delivery systems noted above.

The MTA Study (MTA Collaborative Group, 2004) demonstrated that medication, specifically psychostimulants, is the most effective treatment for reduction of ADHD symptoms, albeit that psychosocial treatments may have some positive impact as well. The majority of the ADHD children in the present study are not receiving medications but some (still a small proportion) are receiving other services. It is unlikely, however, that other services in this population are psychosocial treatments in any way akin to the manualized treatments offered in the MTA Study (Bauermeister et al., 2003). Among ADHD children there is lower service and overall medication use in PR than in the SB and a tendency in that direction for psychostimulant use as well.

While a lower proportion of children with ADHD in PR received services, those who did were more likely to receive psychotropic medications than their counterparts in the SB. This paradoxical site difference, given the higher rate of service use in the SB must involve other factors. While contrary to PR, the majority of SB children with ADHD received some service, less than one-third with a diagnosis of ADHD (according to the DISC-IV) receive medication and less than one fifth receive psychostimulants to treat it. Besides greater availability of services in SB and greater acceptance of medication in PR, this paradoxical finding may also relate to differences in the service systems that are qualitative rather than quantitative. In PR mental health services are regulated so that only psychiatrists are reimbursed for prescribing psychotropic medications. In the SB, other physicians are able to prescribe psychostimulants and receive reimbursement for the visits. We consider that psychiatrists are more likely to follow treatment guidelines for ADHD than primary physicians or other specialists, thus

making it more likely for PR children to receive psychotropic medications once they have accessed the service system.

Of greater importance in the overall picture is the fact that only one-fourth of the children with ADHD receive medications in both sites. This is less than half the medication rate reported by the Centers for Disease Control and Prevention (Sept 2, 2005) (Center for Disease Control and Prevention, 2005), namely that 56.3% of U.S. children with ADHD were on medication. Moreover, among the Puerto Rican children in our study, very few of those with the diagnosis are receiving psychostimulants. The dearth of appropriate treatments may relate to a misperception of the problems among parents and mental health providers or a lack of diagnostic acuity or knowledge of treatment guidelines among the professionals treating these children as well as to differences in the service delivery system.

Given the large proportion of children with ADHD and ADHD-NOS not receiving any kind of services or medication, it is important to ask whether there may be an issue involving our method of ascertainment and that the diagnostic instrument employed (DISC-IV) may be overdiagnosing. Important arguments against this possibility are reports indicating that the DISC-IV has good psychometric characteristics for this diagnosis, as well as the fact that the prevalence rates of ADHD obtained at each wave over three waves, are consistent with prevalence rates reported in other studies (Bird, 2002). It is therefore unlikely that the untreated ADHD cases in our study are false positives.

We found that certain risk variables were also powerful predictors of service, medication and psychostimulant use. The most consistent finding was *Negative child characteristics*, which included poor performance in school, non-engagement in extra-curricular activities and aggressive behaviors. Children who were elevated one standard deviation on this risk composite were more than twice as likely to be receiving service, and nearly twice as likely to be receiving medication. They were 64% more likely to be receiving psychostimulants. Similarly, youth whose relationships with their parents or caretakers were troubled, as measured by *Low maternal Acceptance/warmth*, were also more likely to be receiving service, medication and psychostimulants, although the magnitude of the effect was less strong than the child risks. When service, medication and psychostimulant use were examined in the total population, these general quantitative risk variables were more powerful predictors of treatment than a diagnosis of ADHD. Indeed, when these risks were adjusted, ADHD, ADHD-NOS and diagnoses of other disorders were no longer significant predictors of treatment use, indicating that parental attitudes as well as other risk factors are more likely to lead to service use than the diagnosis itself.

In neither site did we find reliable evidence that treatment patterns changed over the three-year follow-up period. We did find that children who receive services, medication or psychostimulants at one point in time are likely to maintain the treatment at the next wave. Possible barriers to treatment seem to be more relevant than maintenance of children in the service system once care is initiated.

Clinical Implications

Puerto Rican children with ADHD both in the SB and in PR are underserved. Clinicians working with these populations and agencies involved in service delivery must consider the importance of screening for this disorder in schools and day-care settings and referring children who screen positive for subsequent assessments. The fact that a sizeable proportion of caretakers are adverse to the use of medication for treating problems associated with ADHD, indicates that community education is a paramount issue. The findings point to the need for better training among providers, school personnel, and a higher level of community education and outreach efforts. In Puerto Rico, where there are less services available but the treatment

of ADHD children is more likely to be in the hands of specialized psychiatrists and child psychiatrists, a larger proportion of children received the treatment of choice. This finding suggests that training of other professionals or direct involvement by psychiatrists in monitoring the care of ADHD children is necessary.

Limitations

As with any epidemiologic study that is not of broader scope, there are limits to the generalizability of the study findings. Our results are generalizable to Puerto Rican children in PR and the SB. However, they would need to be replicated in other PR populations in the United States and in other Latino populations if they are to be applied more broadly. Comparability with research findings on other ethnic groups is limited by the fact that differences in results could always be attributed to differences in research design, ages under consideration and other methodological differences. A wide array of risk factors are included in our study, but they are by no means exhaustive. Besides demographic variables other known predictors of service utilization, such as parental burden, parent/child relationship and impairment, were considered in our study as indicators within other measures employed, but standardized measures of some of those known constructs (e.g. parental burden) were not. Future studies would require a more formal delineation of these variables.

CONCLUSIONS

Over the course of three years, ADHD was related to mental health service, medication and stimulant use among Puerto Rican children living in the SB and PR. Although both sites presented similar patterns of association with ADHD, rates of service, medication and stimulant use are lower in PR. Other psychiatric diagnosis and general risk variables also seem to be important correlates of use of services and medication, including psychostimulants. Particularly, *Environmental risks* were related to greater mental health service use, but not to medication use. *Negative child behavior* and *Lack of maternal warmth* were related to both service and medication use, while *Negative family influence* was related to less medication use. In both sites the diagnosis itself was a weaker predictor of service and medication use than individual risk variables. While children in PR received less service and medication overall, the patterns of associations were similar across the two sites. The disparities reported in the literature between ethnic minorities and other ethnic groups need to be re-examined. Based on the fact that the same ethnic group shows differences in service and medication use patterns in two different contexts, it is likely that disparities are more related to context than to ethnicity.

Acknowledgements

The primary study was supported by the National Institute of Mental Health through grants RO-1 MH56401 (Dr. Bird, principal investigator) and P-20MD000537-01 (Dr. Canino, principal investigator) from the National Center for Minority Health Disparities. The current work was supported through a contract with McNeil Pediatrics Division of McNeil PPC, Inc.

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Table 1
Prevalence of ADHD, Service, Medication, Psycho-Stimulant Use and Caretaker Attitudes in Two Contexts

	South Bronx									Site Difference					
	Puerto Rico			Wave 1			Wave 2			Wave 3					
	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3	Wave 1	Wave 2	Wave 3			
Estimate %	SE	Estimate %	SE	Estimate %	SE	Estimate %	SE	Estimate %	SE	Diff	Diff	Diff			
Prevalence of ADHD	6.4	0.8	4.7	0.6	4.2	0.7	7.1	0.9	6.0	0.7	0.7	4.5	0.7	-0.3	
Prevalence of ADHD-NOS	7.3	0.8	5.2	0.7	4.4	0.6	7.3	0.7	5.6	0.6	0.6	4.1	0.6	0.3	
Service Use	12.5	1.1	14.3	1.3	13.6	1.3	19.2	1.2	22.5	1.3	1.3	21.5	1.4	-7.9 ^{*****}	
Medication Use	2.8	0.5	3.1	0.5	3.3	0.5	5.7	0.8	5.9	0.7	0.8	5.8	0.8	-2.5 ^{***}	
Psycho-Stimulant Use	1.5	0.3	1.9	0.4	1.8	0.4	3.4	0.6	3.0	0.5	0.5	2.9	0.6	-1.1 ^{\$}	
Service Use among ADHD	40.7	5.8	49.1	6.8	53.8	8.2	51.0	5.6	60.9	5.8	5.8	64.0	6.9	-10.2	
Service Use among ADHD-NOS	19.5	5.0	41.9	6.2	42.4	7.2	47.0	4.6	50.5	5.9	5.9	50.8	6.5	-8.4	
Medication Use among ADHD	15.9	4.6	25.5	6.2	22.2	6.9	22.9	5.3	20.9	5.0	5.0	28.1	6.9	-5.9	
Medication Use among ADHD-NOS	8.2	3.3	10.4	4.1	20.9	5.7	12.9	3.1	21.4	4.9	4.9	18.7	5.2	2.2	
Psycho-Stimulant Use among ADHD	8.8	3.4	18.2	5.2	9.5	4.1	13.8	3.9	11.9	4.0	4.0	17.3	5.3	-7.8	
Psycho-Stimulant Use among ADHD-NOS	7.0	3.1	9.2	3.8	11.2	4.1	7.4	2.5	6.0	2.9	2.9	7.7	3.8	3.5	
Caretaker Attitude toward Medication															
No	42.9	1.9	40.4	2.1	39.4	2.2	65.7	1.8	57.3	1.7	1.7	57.7	1.8	-18.7 ^{*****}	
Maybe	27.7	1.8	31.8	2.0	34.2	2.2	14.3	1.1	20.4	1.5	1.5	16.3	1.3	17.9 ^{*****}	
Yes	29.4	2.1	27.8	2.1	26.4	2.5	20.0	1.6	22.3	1.6	1.6	26.1	1.5	0.3	

Site differences are tested across each corresponding wave

* p<.05

** p<.01

*** p<.001

**** p<.0001

\$ p= 0.06 – 0.10

Table 4
 Longitudinal Patterns of Service, Medication, and Psycho-Stimulant Use over Three Waves

	M.H. Service Use			Medication Use			Psycho-Stimulant Use											
	N	SB	%	N	SB	%	N	SB	%									
No Use at Any Wave	617		67	929		77	851		92	1127		94	889		95	1158		97
New Use at Wave 2 or 3	92		10	81		7	20		2	22		2	14		1	12		1
Variable Use Pattern	73		7	51		4	15		2	14		2	10		1	11		1
Drop Use at Wave 2 or 3	69		7	76		6	18		2	20		2	15		2	13		1
Continued Use over 3 Waves	89		9	65		5	28		3	14		1	10		1	6		1