Asthma and Suicidal Ideation and Behavior among Puerto Rican Adolescents

Frank C. Bandiera, M.P.H., Ph.D.[1,2], **Rafael Ramirez, Ph.D.**[2], **Kristopher L. Arheart, Ed.D.**[1], **Glorisa Canino, Ph.D.**[2], and **Renee D. Goodwin, Ph.D.**[3,4]

[1]Department of Epidemiology and Public Health, Miller School of Medicine, University of Miami

[2]Behavioral Sciences Research Institute, Medical Sciences Campus, University of Puerto Rico, San Juan, Puerto Rico

[3]Department of Psychology, Queens College, City University of New York (CUNY)

[4]Department of Epidemiology, Mailman School of Public Health, Columbia University

Abstract

There is growing evidence of a positive association between asthma and suicidal ideation and behavior in the general community, although information on this potential association is scarce among adolescents and Puerto Ricans, groups at-risk for both conditions. Data came from wave three of the Boricua Youth Study, a longitudinal study of youth in the Bronx and San Juan conducted from 2000–2004. Logistic regressions for correlated data (GEE) were conducted with asthma predicting suicidal ideation and behavior among participants aged 11 years or older. After adjustment for survey design, age, gender, poverty, DSM-IV mental disorders, cigarette smoking, and stressful life events, asthma was positively associated with suicidal ideation and behavior among Puerto Rican adolescents. Public health interventions targeting Puerto Rican adolescents with asthma and future studies investigating potential biological and psychological mechanisms of association are warranted.

Keywords

Asthma; suicidal ideation and behavior; adolescents; Puerto Ricans

INTRODUCTION

Asthma and suicidal ideation and behavior are major public health issues that are common among Puerto Rican youth. In the 1997 to 2001 National Health and Interview Survey, mainland Puerto Rican youth had the highest prevalence of lifetime asthma (26%), in comparison with non-Hispanic Black children (16%), non-Hispanic White children (13%), and Mexican-American children (10%) (Lara et al, 2006). Reports of population based island surveys have shown even higher rates of asthma for Puerto Rican youth, ranging from

34% to 40% (Canino et al, 2006; Cohen et al, 2007; Loyo-Berrios et al, 2006); and a report of a population based island survey showed that the prevalence of suicidal ideation and attempts was 7.3% and 5.9%, respectively (Jones et al, 2008). Findings from the Youth Risk Behavior Survey (YRBS) also report elevated rates of suicide attempts among Hispanics at 8.1% in 2009 (Centers for Disease Control and Prevention, 2012). There is evidence suggesting a link between asthma and suicidal ideation and behavior in adults (Clarke et al, 2008; Druss et al, 2000; Goodwin et al, 2005) and youth (Christiansen et al, 2010; Goodwin et al, 2004; Kuo et al, 2010). Suicidal ideation and behavior includes suicidal ideations, thoughts, plans and attempts. Previous researchers (Borges et al, 2008c; Borges et al, 2007) have collapsed these variables together for a more global measure that can be used with smaller samples with low number of positive suicide outcomes. A recent report by Kuo and colleagues found that Taiwanese youth with asthma were at greater risk for death by suicide in a 12-year longitudinal design (Kuo et al, 2010).

Potential factors (or confounders) that may link asthma and suicidal ideation and behavior include childhood adversity (Romans et al, 2002; Wainwright et al, 2007), socioeconomic status (Christiansen et al, 2010), cigarette use and other substance use (Clarke et al, 2008), and psychopathology (especially depression) (Clarke et al, 2008; Goodwin et al, 2005; Goodwin et al, 2004; Kuo et al, 2010). In the present study available confounders include stressful life events, major depressive disorder, and cigarette smoking. In terms of stress, asthma may have a psychological underpinning that has been often been neglected. In fact, asthma was once called "asthma nervosa" because of anxious, nervous and stressful states asthmatics experience (Douwes et al, 2011).

Recent evidence has suggested that stress could cause the new onset of asthma or exacerbation of existing asthma through neurobiological and immunological pathways through the hypothalamic-pituitary-adrenal (HPA) axis, the sympathetic-adrenal-medullary (SAM) axis, and sympathetic (SNS) and parasympathetic (PNS) arms of the autonomic nervous system (Chen et al, 2007). Further, stress and adverse experiences could cause suicidal ideation and behavior (Conner et al, 2011). Similar to stress and other psychological factors, it is now well established the asthma is associated with depression (Ortega et al, 2002; Ortega et al, 2004), although the exact etiology is not established. For example, there is recent evidence that asthma and depression may be linked by early childhood adversity (Scott et al, 2008). It is well established that depressed persons have more suicidal ideation and behavior than non-depressed persons. Last, cigarette smoking could worsen existing asthma; and there is also an association between cigarette smoking and completed suicide (Miller et al, 2000).

Given that asthma and suicidal ideation and behavior are public health concerns among Puerto Rican adolescents, the purpose of the present study was to establish an association between asthma and suicidal ideation and behavior among Puerto Rican adolescents. We also investigated the relative contribution of demographics, cigarette smoking, stressful life events, and psychopathology in explaining this association. This paper adds to the existing literature by considering an at-risk group, Puerto Rican adolescents, with high rates of asthma and suicidal ideation and behavior. Further, cigarette smoking and depression may be important confounders of the association between asthma and suicidal ideation and behavior. To our knowledge, no previous studies have investigated these possible factors as potential confounders. Further, we also include stressful life events. It is important to note that all three of these factors, stress, depression and cigarette smoking, are modifiable. Thus, if indeed these factors are potential explanatory variables, then the burden of suicidal ideation and behavior, in this at-risk group, may be lowered among asthmatics through prevention and treatment interventions. *We mainly hypothesized that asthma would be positively associated with suicidal ideation and behavior among Puerto Rican adolescents.*

As secondary hypotheses, we hypothesized that stressful life events, major depressive disorder, and cigarette smoking would be important confounds of the association between asthma and suicidal ideation and behavior among Puerto Rican adolescents.

METHODS

Data for this study are from the Boricua Youth Study, a longitudinal epidemiologic study of antisocial behaviors and other psychiatric disorders among Puerto Rican youth living in two contexts (Bird et al, 2006a). This study employed a multistage probability sample design to recruit participants that represented the populations in the South Bronx (New York City) and the standard metropolitan areas of San Juan and Caguas in Puerto Rico. Participants could respond to the interview in English or Spanish. In the Bronx all youth had been born in the US and therefore the interviews were conducted in English. In the South Bronx, 75% of parents and 97% of children chose English. In Puerto Rico 97% of children and 100% of caretakers chose Spanish. More details about the sampling method are provided elsewhere (Bird et al, 2006b).

Participants were children between the ages of 5 and 13 years who were identified by their parents/caregivers as being of Puerto Rican background, and had lived in the household for at least 9 months of the past year at baseline. In this study, we considered children ages 11 to 16 given the young ages of children at baseline and that suicidal ideation and behavior onset typically begins at age 10 among Hispanic adolescents (Borges et al, 2008c; Borges et al, 2007). In wave 3 these same children were three years older so that the majority was age 11 to 16. However, we used ages 11 to 18 because there was 1 youth was age 18 and two were 17; however the sample is really representative in wave 3 of youth age 11–16.

These participants were followed up for an additional two timepoints with a one year interval between them. At least 1 of the child's parents/caregivers residing in the household had to self-identify as being of Puerto Rican background. Children were excluded if their parents identified them as being diagnosed with mental retardation or a developmental disability. A maximum of 3 eligible children per household were allowed to participate in the study. Random selection of children in the household was used for families with more than 3 eligible children. Children were nested within households, and households were nested within primary sampling units.

Procedure

Parent consent and child assent were obtained for all families. The adult informant was the child's biological mother in approximately 89% of the interviews. Participants chose whether they preferred the interview in English or Spanish, and switching between languages was allowed during the interview. Trained lay interviewers conducted the interviews using laptops in the participants' homes. All interviews were audiotaped, and 15% were reviewed for quality control purposes, such as interviewer drift across time. The study was approved by the Institutional Review Boards at the University of Puerto Rico, Medical Sciences Campus and the New York State Psychiatric Institute.

Measures of Asthma, Stressful Life Events, and Cigarette Smoking

Past-year asthma was measured by caregiver report of child's past year asthma by using two questions which included "has your child ever had asthma?" and "During the last year did your child have asthma?" If the caregiver responded No to the first question, then the child did not have asthma; similarly, if the caregiver responded No to the second question, then the child did not have asthma. If the caregiver responded Yes to the second question, then the child did have asthma. Stressful life events were measured using the Stressful Life

Events Scale. This scale was asked to children about 26 major life stressors, such as death of a family member and parents' divorce, during the previous year. This scale was originally used by Johnson and McCutcheon (1980). A modified version, which is used in this study, was used in the National Institute of Mental Health Methods for the Epidemiology of Child and Adolescent Mental Disorders (MECA) study (Goodman et al., 1998). Cigarette smoking was measured as lifetime cigarette use by asking the children whether they had ever smoked a cigarette.

Measure of Psychiatric Disorders and Suicidal ideation and behavior

Psychiatric disorders and suicidal ideation and behavior were measured with the Spanish and English versions of the Diagnostic Interview Schedule for Children (DISC)-IV (Shaffer et al, 2000). The DISC IV is a structured diagnostic interview used to assess parent report of children's DSM IV disorders including during the past year. A child and parent version of the instrument were given to children 11 years of age and older and to all caregivers. The DISC impairment algorithm was used to ensure that psychiatric diagnoses met full DSM-IV criteria.

The following modules of the DISC were used in this study: depressive disorders included major depressive disorder and dysthymia, anxiety disorders included social phobia, panic disorder, generalized anxiety disorder, separation anxiety disorder, and posttraumatic stress disorder, disruptive behavior disorders included attention deficit disorder, oppositional defiant disorder and conduct disorder. For our study the depression diagnosis algorithm was modified so that suicide behavior was not used in the diagnosis of depression to avoid creating an obvious confound between suicidal behavior and depression because they both include suicide behaviors in their conceptual definition. All other DSM-IV criteria implemented in the official DISC-IV diagnostic algorithms were observed. The Spanish version of the DISC-IV has good test-retest reliability, which is comparable to the English version (Bravo et al, 2001; Shaffer et al, 2000). A positive diagnosis was derived if either child or parent reported child's psychopathology.

Suicidal ideation was measured by a positive response to the question, "In the last year do you [he/she if parent was informant'] ever talk seriously about killing yourself? This item differed for youth in that it differentiated between those who thought seriously of killing themselves from those who talked seriously. Suicidal attempt was measured by a positive response to the question, "Now thinking about the whole last year, Has you [he/she] tried to kill yourself [him/herself] or made a suicide attempt?" Suicidal plan was measured by a positive response to the question; "In the last year, did you [he/she] have [say] a plan for exactly how [he/she] would kill yourself [himself/herself]." Thinking about death was measured by a positive response to the following question, "In the last year, was there a time when [he/she if parent was informant] often thought about death or about people who had died or about being dead [himself/herself]." Suicidal ideation and behavior was coded positive if either the child or parent answered Yes to any of the previous questions.

Several studies have shown that children and parents report differentially (Rubio-Stipec et al, 2003; Jensen et al, 1999). How to combine parent and child data to provide reliable and valid diagnoses has been an issue of controversy (Kramer et al, 2003). In community samples, children report more symptoms than parents for certain disorders (CD, anxiety and affective disorders) (Jensen et al, 1999;Piaccentini et al, 1992). Because parent and children may each provide unique and meaningful information, they are both considered key informants in the diagnostic process and for this reason we used the OR rule. Further, we collapsed past year suicidal ideation (positive cases = 43, 3.56%), thoughts (positive cases = 163, 13.19%), plans (positive cases = 11, 0.78%) and attempts (positive cases = 13, 1.22%)

to measure a global construct of suicidal ideation and behavior, since the number of positive cases for each of these factors was small.

Statistical Analyses

All statistical analyses were conducted with SUDAAN software release 10.0 to account for the complex survey design. For our main statistical model we used logistic regression for correlated data in the whole eligible sample. Estimation was conducted with Taylor series linearization methods with robust standard errors. Estimation accounted for stratification, design weights and non-independence of observations due to cluster sampling. In the result section for our model we report adjusted odds ratios and prevalence risk ratios with their 95% confidence intervals. Prevalence risk ratios are based on predicted marginals (model predicted prevalences). These marginals are the model based estimate of the prevalence of suicidal ideation and behavior associated with participants in a particular category of a variable adjusting for all other covariates in the model.

RESULTS

Sample Demographics

Table 1 provides the descriptive characteristics of the sample. The total sample size was 1,550. The mean age was almost 13 years and subjects were almost evenly divided between males and females. Our sample comes from an economically disadvantaged population since only about a third of the sample is above the federal poverty guidelines from the year 2010. The rate of asthma in our sample was above 20%. The prevalence of last year suicidal ideation and behavior in our sample was approximately 14%. The prevalence of major depressive disorder was approximately 1% and lifetime smoking was present in about 4% of the sample. Almost 12% of the sample reported 2 or more stressful life events during the last year. The prevalence of past year suicidal thoughts was 13.19%; past year suicidal ideation was 3.56%; past year suicidal plans was 0.78%; and past year suicide attempt was 1.22%.

Logistic Regression Models

Table 2 presents the parameter estimates and confidence intervals obtained from a logistic regression model of suicidal ideation and behavior. None of the demographic variables (age, gender, poverty) were significant predictors of suicidal ideation and behavior. As expected, major depressive disorder was strongly associated with suicidal ideation and behavior. The odds of suicidal ideation and behavior were more than 11 times larger for those with major depressive disorder in comparison with those without major depressive disorder. The prevalence risk ratio of suicidal ideation and behavior was more than 4 times larger for those with a major depressive disorder in comparison with those without major depressive disorder. Having asthma was significantly associated with suicidal ideation and behavior. The odds of suicidal ideation and behavior were about 1.7 times larger for asthmatics in comparison to non-asthmatics. In terms of risk it increases about 52% for asthmatics in comparison to non-asthmatics. Smoking was strongly associated with suicidal ideation and behavior, such that the odds were about 5 times larger for those who had smoked and the risk was about 3 times larger in comparison with those who had never smoked. Stressful life events were also associated to a higher risk of suicidal ideation and behavior, such that the odds increased by a factor of two and the risk by about 73% among persons with 2 or more stressful life events in comparison with persons with less than 2 stressful life events.

DISCUSSION

Asthma and suicidal ideation and behavior are public health issues among Puerto Rican adolescents. Our study adds to the existing literature by studying a group at-risk in which

there is scarce information. Findings from our study suggest a positive association between asthma and suicidal ideation and behavior among Puerto Rican adolescents even when adjusting for demographics, socioeconomic status, major depressive disorder, conduct disorder, post traumatic stress disorder, cigarette smoking, and stressful life events. After adjusting for the influence of other covariates, our model predicts that having asthma is associated with an increase in the prevalence of suicidal ideation and behavior from 13% to 20%; although major depressive disorder was still the most significant predictor of suicidal ideation and behavior since 61% of depressed adolescents (n = 25) reported suicidal ideation and behavior, which is consistent with previous research findings (Clarke et al, 2008; Goodwin et al, 2005; Goodwin et al, 2004; Kuo et al, 2010). This strong association occurred even if the algorithm used in our study to diagnose depression didn't include suicidal ideation as a symptom of depression. Further, cigarette smoking was also a major determinant of suicidal ideation and behavior in which 44% of smokers reported suicidal ideation and behavior. Stressful life events was also a predictors of suicidal ideation and behavior although to a smaller extent than depression and cigarette smoking.

As mentioned previously, understanding variables that link asthma to suicidal ideation and behavior among an at-risk group is of public health importance. Results from this study can be used first as basic findings that can inform basic behavioral scientists of potential explanatory factors that link asthma with suicidal ideation and behavior to further understand the etiology. We did find that although stressful life events, cigarette smoking and major depressive disorder, are important factors to consider, asthma was still moderately positively associated with suicidal ideation and behavior even after controlling for these variables. Thus, it could be that this association could be further explained by extraneous factors not considered in this study or perhaps there may be a direct link between asthma and suicidal ideation and behavior.

Regardless of the etiology, as mentioned previously understanding factors that link asthma to suicidal ideation and behavior at an at-risk group can inform interventionists. Stress, cigarette smoking and depression are all factors that could be modified through preventive and treatment behavioral interventions. Cognitive-behavioral therapies (CBT) are efficacious in treating depression and reducing stress. To our knowledge there have been no existing studies that have used behavioral interventions, such as CBT, among asthmatic Puerto Rican adolescents. If these interventions are indeed useful in reducing depression and stress among Puerto Rican adolescents, then the burden of suicidal ideation and behavior could be reduced among this at-risk group. Further, intervening at a younger age may prevent the occurrence of suicidal ideation and behavior in adulthood.

Our study has important limitations to consider. First, we used cross-sectional data; and thus, causal inference is limited although there is longitudinal evidence of an association (Goodwin et al, 2005; Kuo et al, 2010). Second, we were not able to adjust for other anxiety disorders, such as panic disorder, due to the small number of positive cases. Our results should not be generalized to other Hispanic subgroups. Further, we collapsed suicidal ideation, plans, attempts, and thoughts about death into suicidal ideation and behavior to increase the number of positive cases with suicidal behavior. This method has been successfully used previously (Borges et al, 2008a; Borges et al, 2008b; Borges et al, 2008c; Borges et al, 2007). The number of positive depression cases (n=25) was low and thus we cannot estimate its parameter with great precision, however the relationship was so strong that we obtained significant results. Our results validate our original decision to keep it in the model even it the number of cases was relatively small. Depression is an important covariate to adjust in the study of suicidal behavior. Further, other potential confounds, such as air pollution (Szyszkowicz et al, 2010) and parent psychopathology may also play a role. Nevertheless, our findings suggest a positive association among a group with high

prevalence rates of both asthma and suicidal behavior; and thus, specialized prevention interventions should be implemented among Puerto Rican adolescents with asthma to possibly prevent suicidal ideation and behavior.

Acknowledgments

REFERENCES

Bird HR, Canino GJ, Davies M, Duarte CS, Febo V, Ramirez R, Hoven C, Wicks J, Musa G, Loeber R. A study of disruptive behavior disorders in Puerto Rican youth: I. Background, design, and survey methods. Journal of the American Academy of Child and Adolescent Psychiatry. 2006a; 45:1032–1041. [PubMed: 16926610]

Borges G, Angst J, Nock MK, Ruscio AM, Kessler RC. Risk factors for the incidence and persistence of suicide-related outcomes: a 10-year follow-up study using the National Comorbidity Surveys. J Affect Disord. 2008a; 105:25–33. [PubMed: 17507099]

Borges G, Benjet C, Medina-Mora ME, Orozco R, Molnar J, Nock MK. Traumatic events and suicide-related outcomes among Mexico City adolescents. J Child Psychol Psychiatry. 2008b; 49:654–66. [PubMed: 18341550]

Borges G, Benjet C, Medina-Mora ME, Orozco R, Nock M. Suicide ideation, plan, and attempt in the Mexican adolescent mental health survey. J Am Acad Child Adolesc Psychiatry. 2008c; 47:41–52. [PubMed: 18174824]

Borges G, Nock MK, Medina-Mora ME, Benjet C, Lara C, Chiu WT, Kessler RC. The epidemiology of suicide-related outcomes in Mexico. Suicide Life Threat Behav. 2007; 37:627–40. [PubMed: 18275369]

Bravo M, Ribera J, Rubio-Stipec M, Canino G, Shrout P, Ramirez R, Fabregas L, Chavez L, Alegria M, Bauermeister JJ, Martinez Taboas A. Test-retest reliability of the Spanish version of the Diagnostic Interview Schedule for Children (DISC-IV). Journal of Abnormal Child Psychology. 2001; 29:433–44. [PubMed: 11695544]

Canino G, Koinis-Mitchell D, Ortega AN, McQuaid EL, Fritz GK, Alegria M. Asthma disparities in the prevalence, morbidity, and treatment of Latino children. Soc Sci Med. 2006; 63:2926–37. [PubMed: 16956704]

Centers for Disease Control and Prevention. Surveillance Summaries. Accessed from http://www.cdc.gov/mmwr/pdf/ss/ss5905.pdf on March 20, 2012.

Chen M, Miller GE. Stress and inflammation in exacerbations of asthma. Brain Behav Immun. 2007; 21:993–999. [PubMed: 17493786]

Christiansen E, Stenager E. Risk for attempted suicide in children and youths after contact with somatic hospitals: a Danish register based nested case-control study. J Epidemiol Community Health. 2010

Clarke DE, Goodwin RD, Messias EL, Eaton WW. Asthma and suicidal ideation with and without suicide attempts among adults in the United States: what is the role of cigarette smoking and mental disorders? Ann Allergy Asthma Immunol. 2008; 100:439–46. [PubMed: 18517075]

Cohen RT, Canino GJ, Bird HR, Shen S, Rosner BA, Celedon JC. Area of residence, birthplace, and asthma in Puerto Rican children. Chest. 2007; 131:1331–8. [PubMed: 17494783]

Conner KR, Houston RJ, Swogger MT, Conwell Y, You S, He H, Gamble SA, Watts A, Duberstein PR. Stressful life events and suicidal behavior in adults with alcohol use disorders: role of event severity, timing, and type. Drug Alcohol Depend. 2011; 120:155–161. [PubMed: 21835560]

Douwes J, Brooks C, Pearce N. Asthma nervosa: old concept, new insights. Eur Respir J. 2011; 37:986–990. [PubMed: 21532014]

Druss B, Pincus H. Suicidal ideation and suicide attempts in general medical illnesses. Arch Intern Med. 2000; 160:1522–1526. [PubMed: 10826468]

Goodman LA, Corcoran C, Turner K, Yuan N, Green BL. Assessing traumatic event exposure: General issues and preliminary findings for the stressful life events screening questionnaire. J Trauma Stress. 1998; 11:521–542. [PubMed: 9690191]

Goodwin RD, Eaton WW. Asthma, suicidal ideation, and suicide attempts: findings from the Baltimore epidemiologic catchment area follow-up. Am J Public Health. 2005; 95:717–22. [PubMed: 15798135]

Goodwin RD, Marusic A. Asthma and suicidal ideation among youth in the community. Crisis. 2004; 25:99–102. [PubMed: 15387235]

Johnson, JH.; McCutcheon, SM. Assessing life stress in older children and adolescents: preliminary findings with the Life Events Checklist. In: Sarason, IG.; Spielberger, CD., editors. Stress and Anxiety. Washington, DC: Hemisphere; 1980.

Jones J, Ramirez RR, Davies M, Canino RD, Goodwin RD. Suicidal behaviors among adolescents in puerto rico: rates and correlates in clinical and community samples. J Clin Child Adolesc Psychol. 2008; 37:448–455. [PubMed: 18470780]

Kuo CJ, Chen VC, Lee WC, Chen WJ, Ferri CP, Stewart R, Lai TJ, Chen CC, Wang TN, Ko YC. Asthma and suicide mortality in young people: a 12-year follow-up study. Am J Psychiatry. 2010; 167:1092–1099. [PubMed: 20634368]

Lara M, Akinbami L, Flores G, Morgenstern H. Heterogeneity of childhood asthma among Hispanic children: Puerto Rican children bear a disproportionate burden. Pediatrics. 2006; 117:43–53. [PubMed: 16396859]

Loyo-Berrios NI, Orengo JC, Serrano-Rodriguez RA. Childhood asthma prevalence in northern Puerto Rico, the Rio Grande, and Loiza experience. J Asthma. 2006; 43:619–624. [PubMed: 17050228]

Miller M, Hemenway D, Bell NS, Yore MM, Amoroso PJ. Cigarette smoking and suicide: a prospective study of 300,000 male active-duty Army soldiers. Am J Epidemiol. 2000; 151:1060–1063. [PubMed: 10873129]

Ortega AN, Huertas SE, Canino G, Ramirez R, Rubio-Stipec M. Childhood asthma, chronic illness, and psychiatric disorders. J Nerv Ment Dis. 2002; 190:275–281. [PubMed: 12011605]

Ortega AN, McQuaid EL, Canino G, Goodwin RD, Fritz GK. Comorbidity of asthma and anxiety and depression in Puerto Rican children. Psychosomatics. 2004; 45:93–99. [PubMed: 15016921]

Romans S, Belaise C, Martin J, Morris E, Raffi A. Childhood abuse and later medical disorders in women. An epidemiological study. Psychother Psychosom. 2002; 71:141–150. [PubMed: 12021556]

Scott KM, Von Korff M, Alonso J, Angermeyer MC, Benjet C, Bruffaerts R, de Girolamo G, Haro JM, Kessler RC, Kovess V, Ono Y, Ormel J, Posada-Villa J. Childhood adversity, early-onset depressive/anxiety disorders, and adult-onset asthma. Psychosom Med. 2008; 70:1035–1043. [PubMed: 18941133]

Shaffer D, Fisher P, Lucas CP, Dulcan MK, Schwab-Stone ME. NIMH Diagnostic Interview Schedule for Children Version IV (NIMH DISC-IV): description, differences from previous versions, and reliability of some common diagnoses. Journal of the American Academy of Child and Adolescent Psychiatry. 2000; 39:28–38. [PubMed: 10638065]

Szyszkowicz M, Willey JB, Grafstein E, Rowe BH, Colman I. Air pollution and emergency department visits for suicide attempts in vancouver, Canada. Environ Health Insights. 2010; 4:79–86. [PubMed: 21079694]

Wainwright NW, Surtees PG, Wareham NJ, Harrison BD. Psychosocial factors and incident asthma hospital admissions in the EPIC-Norfolk cohort study. Allergy. 2007; 62:554–560. [PubMed: 17441796]

Table 1

Demographic characteristics of the eligible sample in the Boricua Youth Study.

Variable	N	Mean / %	95% CI
Age (years)	1550	12.53	12.42 – 12.64
Suicidal ideation and behavior			
Present	181	14.40%	12.00 – 17.19
Absent	1359	85.60%	82.81 – 88.00
Gender			
Male	788	50.99%	48.12 – 53.86
Female	761	49.01%	46.14 – 51.88
Socioeconomic status			
Blow poverty guidelines	1082	69.25%	64.98 – 73.21
Above poverty guidelines	468	30.75%	26.79 – 35.02
Stressful life events			
0–1	1367	88.34%	85.84 – 90.46
2 or more	171	11.66%	9.54 – 14.16
Major Depressive Disorder			
Yes	25	1.19%	0.68 – 1.92
No	1493	98.81%	98.08 – 99.32
Asthma			
Yes	264	21.21%	18.78 – 23.86
No	1284	78.79%	76.14 – 81.22
Ever Smoke			
Yes	46	3.77%	2.66 – 5.18
No	1481	96.23%	94.82 – 97.34

All means, percentages and confidence interval were obtained taking into account stratification, design weights, and non-independence of observations due to cluster sampling. The method of estimation was Taylor series linearization methods. All confidence intervals for percentages less than or equal to 5% were estimated with special methods for extreme percentages (Korn & Graubard, 1998, 1999) since standard methods can provide estimates with poor statistical coverage for very small percentages.

Table 2

Association between asthma and covariates and suicidal ideation and behavior in the Boricua Youth Study.

Predictors	OR[a] (95% CI)	Prevalence[b] Risk Ratio (95% CI)
Age (16 vs. 11 years)	0.97 (0.86–1.09)	0.84 (0.39–1.78)
Gender (male)	1.23 (0.81–1.88)	1.18 (0.84–1.65)
Above Federal Poverty Guidelines	0.99 (0.63–1.57)	0.99 (0.69–1.43)
Major depressive disorder	**11.97 (4.03–35.55)**	**4.52 (3.01–6.78)**
Ever Smoke	**5.42 (2.54–11.56)**	**3.26 (2.11–5.03)**
Stressful life events (2 or more)	**2.04 (1.23–3.38)**	**1.73 (1.19–2.52)**
Asthma	**1.71 (1.11–2.64)**	**1.52 (1.09–2.14)**

Due to missing data we were able to estimate the model with a total of 1513 subjects out of a possible 1550 eligible subjects. This corresponds to a missing data rate of 2.4%. All parameters in the model were obtained using logistic regression for complex samples taking into account stratification, design weights and non-independence of observations due to cluster sampling. The estimation method was Taylor series linearization methods with robust standard errors.

[a] These are adjusted odds ratios controlling for all other variables in the model. Thus, in the analyses with the association between asthma and suicidal ideation and behavior, age, gender, poverty, major depressive disorder, cigarette smoking, and stressful life events were controlled for.

[b] These prevalence risk ratios are based on the predicted marginals which provided an estimate of the model based predicted prevalences (risk) for categories of a variable in the model. These predicted marginals are estimated controlling for all other variables in the model. They should not be confused with incidence risk ratios since our model is based on prevalence data and not incidence data.