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Adverse Childhood Experiences and Sleep Disturbances Among Puerto Rican Young Adults

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Adverse Childhood Experiences and Sleep Disturbances Among Puerto Rican Young Adults

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An abstract of
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Abstract

Adverse Childhood Experiences and Sleep Disturbances Among Puerto Rican Young Adults
By Eudora Louise Olsen

Importance

Sleep quality is a known marker of overall health. Studies suggest that Adverse Childhood Experiences (ACEs) are associated with sleep disturbances in children and adults.

Objective

To explore the association between retrospective and prospective ACEs and sleep quality in a cohort of Puerto Rican young adults from two sociocultural contexts.

Design

Prospective cohort study from Boricua Youth Study (BYS) conducted 2013-2017. Analysis conducted 2023-2024.

Setting

Population-based study representing Puerto Ricans from the South Bronx, New York and Puerto Rico.

Participants

Participants from BYS who participated in the Health Assessment (HA) when they were ages 18-29. Eligibility criteria for BYS included having at least one child in the household that was age 5 to 13 years old and at least one of the child's parents/primary caretakers be of Puerto Rican descent. HA was a subsample of those who were 5-9 years of age at enrollment in BYS and participated in wave 4 of BYS. Of the eligible 982 participants, 83% participated in HA (n = 813).

Exposures

Prospective ACEs measured from parent and youth responses and retrospective ACEs measured among young adults using questions from validated questionnaires.

Outcomes

Sleep quality assessed in HA with the Pittsburgh Sleep Quality Index (PSQI). Summary score included 7 components of PSQI.

Results

813 participants, 53.9% of the participants lived in Puerto Rico as children, 50.55% identified as female, and average age of participants was 22.9 (SE = 0.074). After adjusting for sociodemographic factors, retrospective ACEs have a significant association with worse sleep outcomes ($B = 0.29$, $SE = 0.074$, $p < 0.001$). Prospective ACEs do not have a significant association with sleep quality, after adjusting for sociodemographic factors ($B = 0.051$, $SE = 0.095$, $p = 0.59$).

Conclusions

There is a significant association between retrospective ACEs and sleep quality among Puerto Rican young adults, after adjusting for sociodemographic factors. Prospective ACEs were not significantly associated with sleep disturbances, after adjusting for sociodemographic factors. Addressing ACEs reported in young adulthood may help reduce sleep disorders.

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Introduction

Sleep quality is a known marker of overall health and is a chronic health issue in the U.S.[1,2] In addition to the racial and ethnic disparities impacting sleep quality, recent studies suggest that Adverse Childhood Experiences (ACEs) are associated with sleep disturbances and other chronic diseases in adults.[3,4] ACEs are defined as stressful or traumatic life events that occur in the first 18 years of life.[5] It is estimated that about 58% of youth in the US have experienced at least 1 or more ACE, with a higher prevalence of ACEs among non-White Hispanic and Black children.[5,6,7] Our research group previously found a significant association between childhood adversity and poor sleep outcomes among Puerto Rican children.[8] Although ACEs can be assessed both prospectively during childhood and retrospectively in adulthood, no previous study on ACEs and sleep quality has utilized both forms of reporting to our knowledge. Despite the utility of retrospective ACEs and patient preference to be screened, both patients and physicians report that fewer than 10% of adult patients are asked about ACEs.[9,10] Furthermore, research has shown low agreement between prospective and retrospective ACEs, suggesting that these two forms of reporting may identify distinct groups of people with unique risk factors for various health outcomes.[11,12]

Compared to previous research on ACEs and sleep, our study introduces a new age group to consider: young adults. Young adults, defined as approximately ages 18 to 26, are a uniquely underrepresented population in research.[13] Young adulthood is a critical period of complex cognitive and emotional maturation, including increased rates of risky behavior and accidental death.[13] Despite the high incidence of mental and physical health issues among young adults, this population is less likely to seek healthcare or undergo routine screening compared to other age groups.[14]

Considering the disparities in research that exist for Puerto Rican young adults, as well as the promising importance of both retrospective and prospective ACEs, our paper explores the relationship between prospective and retrospective ACEs and sleep quality in a geographically diverse population of Puerto Rican young adults. Understanding this relationship has the potential to inform interventions to address ACEs, improve sleep quality, and reduce health disparities for Puerto Ricans.

Methods

Study Population

Study participants are from the Boricua Youth Study (BYS), a longitudinal cohort of Puerto Rican children living in the South Bronx, New York and Puerto Rico from August 2000 to August 2003. Details on the study sampling, design, and procedures can be found elsewhere.[15] In brief, 2,491 Puerto Rican children and adolescents aged 5 to 13 years old were recruited at baseline from South Bronx, NY (n = 1,138) and in the standard metropolitan area of San Juan and Caguas, PR (n = 1,353). Eligibility criteria for the Boricua Youth Study included having at least one child in the household that was age 5 to 13 years old and at least one of the child's parents/primary caretakers be of Puerto Rican descent. Participant ethnicity was assessed through a questionnaire. The Boricua Youth Study Health Assessment (HA) recruited a subsample of those who were 5-9 years of age at enrollment and participated in wave 4 from April 2013 to August 2017. Of the eligible 982 participants, 83% participated in HA (n = 813). Data for this study comes from those who participated in HA. BYS was approved by the Institutional Review Boards at the New York State Psychiatric Institute and the University of Puerto Rico Medical Sciences Campus. Informed consent was obtained from participants, and interviews were conducted in English and Spanish.

Main Exposure: Adverse Childhood Experiences

Prospective ACEs are defined as those reported in childhood and retrospective ACEs are those reported in young adulthood. Prospective ACEs were reported by parents and youth using the 10 items outlined in the original ACEs Study and collated from several other validated screening measures.[16,17] Responses were characterized as binary variables: "yes" or "no." ACEs were then reported retrospectively by young adults in HA using a 10-item questionnaire from the original ACEs Study.[16] Since these surveys differed, we used the 8 overlapping items that were present in both surveys to conduct the analysis for this study. The number of ACEs was categorized into four groups: 0 ACEs, 1 ACE, 2-3 ACEs, and 4+ ACEs.

Main Outcome: Sleep Quality

Sleep quality was assessed with the Pittsburgh Sleep Quality Index (PSQI) in young adulthood at the same time as retrospective ACEs were collected in the HA study.[18] A summary score was generated by summing the 7 components of the PSQI, which included subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. A binary variable was created to categorize scores >5 as "poor sleep" and scores ≤5 as "good sleep."

Covariates

Sociodemographic information included self-reported age (in years), sex (male or female), receipt of public assistance (yes or no), highest education grade completed, and geographical location in childhood (South Bronx or Puerto Rico).

Statistical Analysis

Statistical analysis was performed in 2023. Univariable analyses were conducted in the overall sample to examine the distribution of ACEs and sociodemographic factors. Separate

multivariable linear regression models were used to examine the association between retrospective ACEs and prospective ACEs as both continuous and categorical variables and sleep quality, adjusting for covariates. Unstandardized beta coefficients and 95% confidence intervals (CI) were calculated from these models. A cross product term between ACEs and study site variable was included in the model to assess for interaction by site. Type III test were used to examine statistical significance of the interaction term.

Similarly, log-binomial multivariable regression models were used to examine the association between retrospective and prospective ACEs and sleep quality as a dichotomous variable, adjusting for all covariates. Relative Risk (RR) and 95% CI were estimated from these models. All analyses included study sample weights to account for the unequal probability of selection into the study based on each site's sampling design and to be representative of the age and gender distributions of the 2000 U.S. Census. Nonresponse weights were calculated using a logistic regression model that included participant and parent characteristics predictive of responding to the HA study. The final analysis weights were then calculated as a product of the HA nonresponse weights and the original BYS sampling weights to reflect the BYS reference population in each site. Analyses were conducted in SAS version 9.4 with significance level was set at α=0.05 and 2-sided hypothesis testing.

Results

Participant characteristics in the overall sample and by study site are shown in **Table 1**. In the sample of 813 participants, 53.9% of the participants lived in Puerto Rico as children, 50.6% identified as female, and 27.8% of all participants reported receiving public assistance. The average age in years of participants was 22.9 (SE = 0.074), and the most frequent highest education grade completed was twelfth grade (34.16%). 42.2% identified as having a PSQI score

of greater than 5, indicating poor sleep. 78.8% of participants reported having at least one prospective ACE, and 66.9% of participants reported having at least one retrospective ACE. Compared to those from Puerto Rico, those from the Bronx had on average worse sleep quality (Mean PSQI= 5.68, SE = 0.16), higher levels of prospective ACEs (Mean = 1.37, SE = 0.06), and higher levels of retrospective ACEs (Mean = 1.73, SE = 0.09).

Results from the adjusted and unadjusted linear regression models investigating ACEs as both a categorical predictor and a continuous predictor of sleep quality are shown in **Table 2, Table 3, Table 4,** and **Table 5**. A correlation analysis of retrospective and prospective ACEs showed low but statistically significant correlation between these two measures ($r = 0.134$, $p < 0.001$). When prospective ACEs were examined as a categorical variable and adjusted for covariates, no level of ACEs was found to be significantly associated with sleep quality. When examined as a continuous variable and adjusted for covariates, prospective ACEs were not found to have a significant associated with sleep quality (Beta = 0.051, SE = 0.095, $p = 0.59$).

When retrospective ACEs were examined as a categorical variable and adjusted for covariates, higher levels of ACEs (2 or more ACEs) were significantly associated with worse sleep outcomes (2-3 ACEs Beta = 1.25, SE = 0.31, $p < 0.001$; 4+ ACEs Beta = 1.21, SE = 0.38, $p = 0.002$). When retrospective ACEs were examined as a continuous variable and adjusted for covariates, they were found to be significantly associated with worse sleep outcomes (Beta = 0.291, SE = 0.074, $p < 0.001$). Additionally, these results did not vary significantly by site (interaction $p > 0.05$).

When PSQI was examined as a binary variable, those with a greater number of retrospective ACEs were more likely to have poor sleep quality compared to those with fewer retrospective ACEs, after adjusting for sociodemographic factors (Adjusted Risk Ratio: 1.22,

95% CI: 1.056, 1.417). Prospective ACEs were not found to have a statistically significant association with poor sleep quality as a binary variable.

Discussion

In this cohort of 813 Puerto Rican young adults, retrospective ACEs were significantly associated with poor sleep quality and prospective ACEs were not significantly associated with poor sleep quality, after controlling for sociodemographic factors. There are several hypotheses that may explain these findings. Research suggests that ACEs are associated with a stress and fear response that can lead to disruption in regular routines and sleep and circadian dysregulation.[16] The difference in associations seen with prospective and retrospective ACEs may be due to the fact that prospective ACEs were gathered over the first 11 years of the child's life, resulting in a gap in reporting during the adolescent period. This could explain the appearance of over-reporting in young adulthood, which may represent events that occurred during the adolescent period.[19] Furthermore, research shows that retrospective ACEs strongly predict subjectively measured outcomes, such as the PSQI.[20] Those with retrospective ACEs could have demonstrated more enduring effects of ACEs, resulting in worse sleep outcomes in young adulthood compared to those who did not retrospectively report ACEs.

There are several strengths to this study. Most studies on ACEs and sleep quality focus on White and Asian populations, but our study diversifies the Hispanic/Latino diaspora by focusing on Puerto Ricans. The geographical diversity of this cohort allowed us to examine whether social context may modify the ACEs and sleep quality association. Furthermore, our study prioritizes an understudied age group to highlight the specific circumstances of young adults, which has potential clinical relevance for supporting the pediatric-to-adult transition in medical care. Other strengths of this study include the large sample size, longitudinal design, and

high compliance rate at follow-up. This study also contributes to the growing body of evidence that supports the utility of both retrospective and prospective ACEs when assessing overall health.[11]

Limitations

Despite these strengths, there are some limitations of our study to consider. Although the PSQI is a validated survey, it is a self-reported measure that has been shown to poorly correlate with objective measures of sleep quality, such as polysomnography.[18,21,22] Retrospective ACEs do not capture the exact timing of an event, while the prospective measure of ACEs provides a more specific timeline for ACEs. Recall bias is a consideration when observing the results from the retrospective measures, although research shows no evidence of recall bias in the retrospective assessment.[23] There is also the possibility of reporter bias with retrospective ACEs, as the same informant is reporting on the exposure and outcome at the same time. However, reporter bias from retrospective ACEs has been shown to have the potential to both over-predict and under-predict subjective health outcomes, so the effect of this bias in our study is indeterminant.[20] It is also possible that prospective ACEs are under-reported in cases of harm to a child.[28] Additionally, the ACE questionnaires used in this study give equal weight to each ACE, which does not take into account descriptive measures such as frequency and chronicity of ACEs. Finally, since our study focused on a population of young adults in two urban settings, future studies should exercise caution when generalizing these findings to other demographics.

Conclusion

In conclusion, Puerto Rican young adults who retrospectively reported higher numbers of ACEs were more likely to have worse sleep quality when controlling for sociodemographic factors, and no significant association was found between prospective ACEs and sleep quality

among Puerto Rican young adults. This study suggests that prospective and retrospective ACEs are an important metric of overall health and may be a useful screening tool for understanding sleep health in young adults. Subsequent studies should include objective measures of sleep quality, weighted ACE questionnaires, and should explore specific pathways that may explain the association between ACEs and sleep disturbances.

Table 1. Participant Characteristics by Study Site, Health Assessment Study

	Participants, Number (%)		
Variable	All (N=813)	South Bronx (N=375)	Puerto Rico (N=438)
Sex			
Female	411 (50.55)	182 (48.53)	229 (52.28)
Age (years)			
18-23	508 (62.48)	170 (45.33)	283 (64.61)
24-29	305 (37.51)	205 (54.67)	155 (35.39)
Highest Education Grade Completed			
6th grade	2 (0.25)	0 (0.00)	2 (0.46)
7th grade	5 (0.62)	1 (0.27)	4 (0.92)
8th grade	6 (0.74)	4 (1.07)	2 (0.46)
9th grade	17 (2.10)	12 (3.22)	5 (1.15)
10th grade	33 (4.08)	31 (8.31)	2 (0.46)
11th grade	46 (5.69)	42 (11.26)	4 (0.92)
12th grade	276 (34.16)	129 (34.58)	147 (33.79)
College freshman	116 (14.36)	51 (13.67)	65 (14.94)
College sophomore	118 (14.60)	55 (14.75)	63 (14.48)
College junior	69 (8.54)	16 (4.29)	53 (12.18)
College senior	90 (11.14)	21 (5.63)	69 (15.86)
1+ years of graduate school	30 (3.71)	11 (2.95)	19 (4.37)
Receiving Public Assistance	226 (27.80)	70 (18.67)	156 (35.62)
Prospective ACEs			
None	229 (28.17)	87 (23.20)	142 (32.42)
1 ACE	302 (37.15)	143 (38.13)	159 (36.30)
2-3 ACEs	241 (29.64)	125 (33.33)	116 (26.48)
4+ ACEs	41 (5.04)	20 (5.33)	21 (4.79)
Retrospective ACEs			
None	269 (33.09)	90 (24.00)	179 (40.87)
1 ACE	287 (35.30)	127 (33.87)	160 (36.53)
2-3 ACEs	167 (20.54)	98 (26.13)	69 (15.75)
4+ ACEs	90 (11.07)	60 (16.00)	30 (6.85)
Individual Prospective ACEs			
Verbal abuse	106 (13.37)	57 (15.66)	49 (11.42)
Physical abuse	158 (20.00)	76 (20.99)	82 (19.16)
Sexual abuse	35 (4.51)	18 (5.14)	17 (3.99)
Neglect	131 (16.48)	59 (16.12)	72 (16.78)
Divorce/Separation	369 (46.89)	213 (60.17)	156 (36.03)
Domestic Violence	19 (2.37)	7 (1.89)	12 (2.77)
Substance Use in Home	125 (15.47)	52 (13.98)	73 (16.74)
Maternal Mental Health Issues	212 (26.24)	84 (22.58)	128 (29.36)
Individual Retrospective ACEs			
Verbal abuse	122 (15.01)	80 (21.33)	42 (9.59)
Physical abuse	96 (11.81)	63 (16.80)	33 (7.53)
Sexual abuse	62 (7.64)	38 (10.16)	24 (5.48)

Neglect	24 (2.95)	21 (5.60)	3 (0.68)
Divorce/Separation	464 (57.21)	248 (66.31)	216 (49.43)
Domestic Violence	73 (9.01)	51 (13.64)	22 (5.05)
Substance Use in Home	140 (17.26)	92 (24.60)	48 (10.98)
Maternal Mental Health Issues	120 (14.80)	56 (14.97)	64 (14.65)
PSQI Score			
Good sleep (≤5)	470 (57.81)	192 (51.20)	278 (63.47)
Poor sleep (>5)	343 (42.19)	183 (48.80)	160 (36.53)

Abbreviations: ACEs = Adverse Childhood Experiences, PSQI = Pittsburgh Sleep Quality Index

Table 2. Association between Prospectively Reported ACEs as a Categorical Variable and Sleep Quality

	Unadjusted Model		Adjusted Model[a]	
Characteristic	Beta (SE) [95% CI]	*P* value	Beta (SE) [95% CI]	*P* value
No ACEs	Ref	NA	Ref	NA
1 ACE	0.1663 (0.275) [-0.374, 0.707]	0.55	0.069 (0.275) [-0.471, 0.609]	0.80
2-3 ACEs	0.148 (0.289) [-0.420, 0.715]	0.61	0.041 (0.288) [-0.525, 0.607]	0.89
4+ ACEs	0.355 (0.517) [-0.660, 1.370]	0.49	0.374 (0.514) [-0.635, 1.384]	0.47
From Puerto Rico	NA	NA	-0.960 (0.233) [-1.418, -0.502]	<0.001[b]
Female	NA	NA	0.436 (0.223) [-0.003, 0.874]	0.05
Age (years)	NA	NA	0.011 (0.052) [-0.092, 0.113]	0.84
Highest Education Grade Completed (3rd grade to graduate school)	NA	NA	0.021 (0.059) [-0.096, 0.137]	0.73
Public Assistance	NA	NA	0.050 (0.264) [-0.469, 0.568]	0.85

Abbreviations: ACEs = Adverse Childhood Experiences, NA = Not Applicable, SE = Standard Error, CI = Confidence Interval, Ref = Reference level

[a]Model controlled for site, sex, age, education, and receiving public assistance

[b]Significant at p-value <0.05

Table 3. Association between Prospectively Reported ACEs as a Continuous Variable and Sleep Quality

	Unadjusted Model		Adjusted Model[a]	
Characteristic	Beta (SE) [95% CI]	*P* value	Beta (SE) [95% CI]	*P* value
Total ACEs	0.066 (0.095) [-0.121, 0.252]	0.49	0.051 (0.095) [-0.135, 0.237]	0.59
From Puerto Rico	NA	NA	-0.957 (0.232) [-1.413, -0.502]	<0.001[b]
Female	NA	NA	0.431 (0.223) [-0.007, 0.868]	0.05
Age (years)	NA	NA	0.011 (0.052) [-0.091, 0.113]	0.84
Highest Education Grade Completed (3rd grade to graduate school)	NA	NA	0.022 (0.059) [-0.093, 0.137]	0.708
Public Assistance	NA	NA	0.058 (0.263) [-0.458, 0.574]	0.83

Abbreviations: ACEs = Adverse Childhood Experiences, NA = Not Applicable, SE = Standard Error, CI = Confidence Interval
[a]Model controlled for site, sex, age, education, and receiving public assistance
[b]Significant at p-value <0.05

Table 4. Association between Retrospectively Reported ACEs as a Categorical Variable and Sleep Quality

	Unadjusted Model		Adjusted Model[a]	
Characteristic	Beta (SE) [95% CI]	*P* value	Beta (SE) [95% CI]	*P* value
No ACEs	Ref	NA	Ref	NA
1 ACE	0.433 (0.263) [-0.083, 0.950]	0.100	0.375 (0.263) [-0.142, 0.892]	0.155
2-3 ACEs	1.458 (0.305) [0.859, 2.056]	<0.001[b]	1.249 (0.310) [0.641, 1.857]	<0.001[b]
4+ ACEs	1.456 (0.373) [0.724, 2.188]	<0.001[b]	1.211 (0.380) [0.465, 1.957]	0.002[b]
From Puerto Rico	NA	NA	-0.735 (0.235) [-1.196, -0.274]	0.002[b]
Female	NA	NA	0.304 (0.222) [-0.132, 0.739]	0.172
Age (years)	NA	NA	0.008 (0.052) [-0.094, 0.109]	0.881
Highest Education Grade Completed (3rd grade to graduate school)	NA	NA	-0.004 (0.058) [-0.118, 0.111]	0.95
Public Assistance	NA	NA	0.035 (0.260) [-0.476, 0.545]	0.89

Abbreviations: ACEs = Adverse Childhood Experiences, NA = Not Applicable, Ref = Reference Level, SE = Standard Error, CI = Confidence Interval
[a]Model controlled for site, sex, age, education, and public assistance
[b]Significant at p-value <0.05

Table 5. Association between Retrospectively Reported ACEs as a Continuous Variable and Sleep Quality

	Unadjusted Model		Adjusted Model[a]	
Characteristic	Beta (SE) [95% CI]	*P* value	Beta (SE) [95% CI]	*P* value
Total ACEs	0.356 (0.072) [0.214, 0.497]	<0.001[b]	0.291 (0.074) [0.145, 0.437]	<0.001[b]
From Puerto Rico	NA	NA	-0.762 (0.235) [-1.224, -0.300]	0.001[b]
Female	NA	NA	0.321 (0.222) [-0.115, 0.756]	0.15
Age (years)	NA	NA	-0.005 (0.052) [-0.106, 0.096]	0.92
Highest Education Grade Completed (3rd grade to graduate school)	NA	NA	0.003 (0.058) [-0.112, 0.117]	0.96
Public Assistance	NA	NA	0.029 (0.260) [-0.482, 0.541]	0.91

Abbreviations: ACEs = Adverse Childhood Experiences, NA = Not Applicable, SE = Standard Error, CI = Confidence Interval

[a]Model controlled for site, sex, age, education, and public assistance

[b]Significant at p-value <0.05

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