



Think Inside the Box: the Heterogeneity of “in Risk” Among “at Risk” Female African American Adolescents in North Carolina

Irene A. Doherty^{1,2} · F. A. Browne¹ · W. M. Wechsberg¹

Received: 4 November 2019 / Revised: 26 February 2020 / Accepted: 2 March 2020 / Published online: 15 April 2020
© W. Montague Cobb-NMA Health Institute 2020

Abstract

Introduction An abundance of research investigates the health of often referred to as “at risk” or “high risk” youth from underserved communities and usually racial/ethnic minorities. These ubiquitous terms relate to poverty, violence, and unsafe behaviors (e.g., sex without condoms, alcohol, and drug use).

Methods This analysis distinguished the heterogeneity of risks among African American female adolescents recruited for an intervention study from underserved communities in North Carolina. Eligibility included: ages 16–19, considered or dropped out of school, never completed high school, and during the past 3 months had sex with a male partner and used drugs or alcohol. A variable was created to represent the continuum of risk comprised of history of homelessness, or trading sex, or current heavy alcohol and marijuana use. Participants fell into 0, 1, or 2–3 categories. Ordinal logistic regression estimated the odds of adverse poor outcomes by category. Linear regression estimated reduction in material and emotional support by category.

Results Of the 237 participants, 59.5%, 27.8%, and 12.7% were in 0, 1, or 2–3 categories, respectively. Relative to adolescents in 0 categories, participants in other categories were more likely to report food insecurity (OR = 3.27, 95%CI [1.8, 5.94]); past arrest (OR = 3.56 [2.08, 6.09]); run away (OR = 3.30 [1.79, 6.10]); multiple sex partners (2.97 [1.61, 5.48]); and vaginal/anal sexual abuse (OR = 3.21 [1.73, 5.96]). Material and emotional support was significantly lower for participants in 2–3 risk categories.

Conclusions Vague use of “at risk” fails to recognize the heterogeneity of experiences and needs of underserved African American youth.

Keywords African American · Adolescent · Substance abuse · Risk behaviors · Sexual · Female

Background

An abundance of social science research has sought to elucidate the harmful experiences of African American adolescents residing in low resource, underserved, urban communities, who are often described as “at risk” or “high risk” youth (e.g., [1]). These terms are ubiquitous in the literature yet may describe a diversity of behaviors and experiences. Health disparities include combinations of experiences with alcohol and substance use [2], sexual behaviors [2–4], running away [5], school dropout [6–8], homelessness [9, 10], gang involvement [5, 11–13], dating violence [14], victimization [15–17], mental health disorders [3, 4, 18], juvenile

delinquency [19], LGBTQ struggles [20], pregnancy [21], sexually transmitted infections (STIs) [22], and neighborhood violence [23–25]. Clearly many of these factors co-occur [26] or intersect [6, 27], and the timing and correlation renders them potentially challenging to sort out. Determining what is a risk factor or protective factor [28] and what is the outcome can quickly become misunderstood, mislabeled, and stigmatizing, especially for an ill-defined “high risk” population. Such aggregation fails to recognize that these young people have both negative and, more importantly, positive influences in their lives that affect their behavior, health, and well-being. Decomposing, delineating, and quantifying the heterogeneity of positive forces and risks can help schools, social services, medical services, and communities in general pinpoint adolescents’ needs.

Acknowledging and disentangling the concept of “at risk” youth is not new. Swahn and Bossarte [29], for example, compared the prevalence of measures of violence and delinquency (e.g., owning a gun), suicide, substance use, parental monitoring, and school (low grades, skipping school, teachers care) among 9th graders using data from three studies: (1)

✉ Irene A. Doherty
Irene.doherty@gmail.com

¹ RTI International, Research Triangle Park, Durham, NC, USA

² Julius L. Chambers Biomedical/Biotechnology Research Institute, North Carolina Central University, Durham, NC, USA

LINKAGES conducted in a school district located in a poor neighborhood; (2) 2003 Youth Risk Behavior Survey (a national probability sample); and (3) Wave 1 of the National Longitudinal Study of Adolescent Health (Add Health) (a national survey of in-school youth). Although most of the violence-related variables such as suicidal thoughts were more prevalent among youth in the LINKAGES study, alcohol use was more prevalent in the nationally representative studies. The authors make the distinction between high risk *behavior* and living in a high risk *environment* and recommend avoiding these terms unless specifically quantified [29].

Houck et al. [30] also conducted a study to differentiate risk profiles among the youth recruited from reproductive health clinics and considered at high risk for sexually transmitted infections (STIs) and unintended pregnancy because the eligibility criteria included reporting having sex without a condom in the previous 90 days. Other eligibility criteria included 15–21 years of age, not pregnant, and not living with HIV. Using latent class analysis, participants were classified into one of three risk clusters. The highest risk cluster for female youth was characterized by sexual behaviors that increase the likelihood of STIs and pregnancy. Contrary to the authors' hypothesis, African-American adolescents accounted for the highest proportion in the *lowest* risk cluster. This finding is consistent with another cluster analysis of Wave 3 of Add Health that also created sexual risk profiles [31]. Although African American women had the highest prevalence of STIs, they had the lowest risk profiles for STIs. High endemic prevalence of STIs likely accounts for these disparities [31]. Thus, African American adolescents and young women in both a nationally representative sample and from a clinic sample were not necessarily "at risk" or "high risk" as often conceived in the literature. To best develop programs, social services, and interventions requires understanding that the needs for all African American young people are not universal. The question remains, which youth are at risk and what are they at risk for?

In light of the complexities and vague yet pervasive use of "at risk," coupled with findings from our formative qualitative interviews [6], we hypothesize that some African American female youth living in underserved, low wealth communities have more experiences than their peers with risk behaviors, or poor health, or risk environments, or any combination of the three domains [6, 32, 33]. In other words, some African American youth are "in risk" or at greater risk than others.

This analysis sought to disentangle the constellation of behaviors and experiences among a sample of African American female adolescents recruited from underserved neighborhoods in two cities in North Carolina to test a behavioral intervention. This analysis strived to distinguish and describe differences among adolescents who were "in risk" within a sample of "at risk" youth.

Methods

This analysis uses baseline data from the 237 participants of the Young Women's CoOp, a randomized trial that tested the efficacy of an adapted evidence-based behavioral intervention to reduce alcohol and other drug (AOD) use, increase condom use and safer sexual behaviors, reduce violence, and set positive personal goals [34]. The control group received an equal-attention intervention for improving nutrition and physical activity. The Centers for Disease Control and Prevention (CDC) Adopting and Demonstrating Adaptation Prevention Techniques (ADAPT-2) initiative supported the study [35]. The trial phase of the study took place in the cities of Raleigh and Durham, North Carolina, from May 2010 to October 2012. The methods of the Young Women's CoOp study have been described in previous publications [32, 34, 36] and are summarized here.

The eligibility criteria were designed to reach African American female adolescents at risk of STIs, alcohol or drug misuse or addiction, and violence. Female youth were eligible if they were Black/African American; 16 to 19 years of age; had ever dropped out of school or considered dropping out; did not have a high school diploma or GED; had vaginal sex with a male partner in the previous 3 months; used alcohol or other drugs in the previous 3 months; and planned to remain in the area for the 6-month duration of the study. A convenience sample was recruited from underserved neighborhoods through a combination of street outreach, collaboration with community-based service providers, flyers, Facebook marketing, and participant referral using recruitment coupons. The Institutional Review Board at RTI International approved all study procedures and waived obtaining parental consent for minors; the study obtained a Certificate of Confidentiality issued by the CDC. CDC staff did not have any interaction with participants.

Measures

The extensive baseline questionnaire was both interviewer- and self-administered for the sensitive topics using audio computer-assisted self-interviewing (ACASI) software. It assessed sexual behaviors; alcohol and drug use; physical, sexual, and emotional abuse; gang violence; neighborhood violence; psychosocial measures; and markers of poverty.

Socioeconomic status variables included housing insecurity (moved ≥ 2 times in the past 6 months, ever been homeless, and ever run away from home), food insecurity (not having enough money to buy food), whether the participant had a child and had ever been arrested. Participants were classified as having run away if they stated that running away was one of the reasons they dropped out of school or if they responded yes to the question, "During the past 3 months, have you run away from home?"

We used a combination of questions from the Alcohol Use Disorders Identification Test (AUDIT) [37] to create a variable indicating heavy alcohol use, defined as drinking at least two times per month and at least three drinks each time. On the basis of a previous analysis of these data examining the relationship between gang membership and marijuana [36], we defined substance abuse as smoking marijuana at least 70–90 days during the past 90 days.

Sexual behavior measures included: two or more sex partners during the previous 30 days, know or suspect main partner had multiple partners in the previous 30 days, AOD use at last sex, partner AOD use at last sex, and condomless sex at last episode of vaginal sex.

Measures of abuse included history of physical abuse, unwanted sexual touching, oral sex, or anal/vaginal sex. The survey also asked participants if they were currently experiencing emotional abuse from their main partner.

Perceived neighborhood violence was measured with a scale ($\alpha = 0.92$) ranging from 0 to 36 that asked the participant how often she observed or was aware of violent events (e.g., murder, fights with weapons).

On the basis of the findings from the formative phase of this study, we developed two assessments to measure material support ($\alpha = 0.81$) and emotional support ($\alpha = 0.60$). The questionnaire asked, “When you need money and other things, how helpful is/are your ...” for 12 types of people such as boyfriends, parents, and friends (options included “not at all helpful,” “somewhat helpful,” and “a great deal helpful”). The scale for emotional support asked participants “When you go to talk about a personal problem, how helpful is/are your ...,” using the same series of types of people. Internal consistency estimates were established using Cronbach’s α . Estimates of 0.60 are sufficient for initial item set use and associated analyses. The Center for Epidemiologic Studies Depression Scale (CES-D) assessed depression [38].

Primary Composite Variable

On the basis of preliminary analyses, extant literature, and knowledge about “at risk” and “high risk” adolescents, we created a variable that was a composite of three correlated variables representing a continuum of especially adverse outcomes. Figure 1 illustrates the concept of the composite variable. The Venn diagram (i.e., “the box”) displays the frequencies of three intersecting circles from the baseline questionnaire: (1) ever homeless, (2) ever traded sex, and (3) chronic substance abuse (defined as heavy alcohol consumption and smoking marijuana 70–90 days during the past 90 days). The three-pronged composite variable indicated the participant’s location in the box as within 0, 1, or 2–3 intersecting circles.

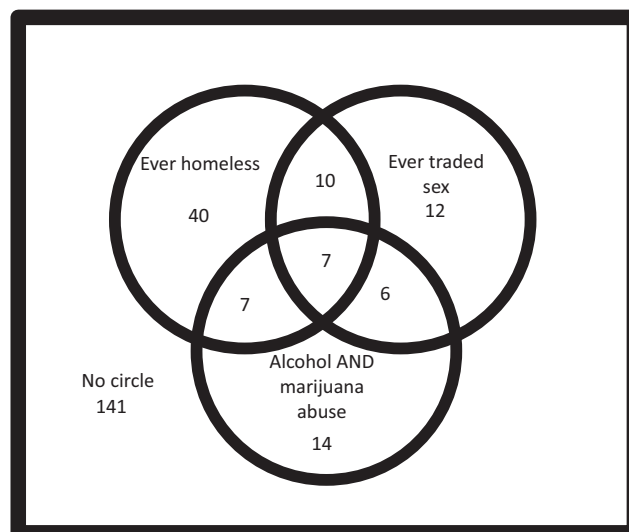


Fig. 1 The Box of Intersecting Risk Circles^a

Analysis

Initial analyses comprised descriptive statistics, tabular analysis for dichotomous and categorical variables, and analysis of variance for continuous variables. As alluded to the background, choosing which variable is the dependent versus the independent variable can be arbitrary in cross-sectional studies when most of the variables are correlated. For example, some youth may run away, become homeless, and perhaps join gangs for protection. Or, the sequence of events could occur in a different order. After joining a gang, perhaps they run away from home. Our analyses treated *the box* location variable as both the outcome and the independent variable. It was the outcome for categorical variables and the independent variable for continuous measures, as detailed below.

For the categorical measures (listed in Table 2), we applied ordinal logistic regression because ordinal regression captures the incremental effects of where participants were classified in *the box*. The use of ordinal regression, however, hinges on whether an independent variable meets the proportional odds assumption, meaning that the effect estimate is comparable for each level of the outcome. We tested whether each variable met the proportional odds assumption using the Brant test with the *omodel* function in Stata (version 13, College Station, TX). For categorical variables that did not meet the proportional odds assumption, we performed three logistic regression models. The first model estimated the odds for being in 1 risk circle relative to being in zero circles (0→1). The second model estimated the odds of being in 2 or 3 risk circles relative to zero circles (0→2 or 3). The last logistic regression estimated the odds of being in 2 or 3 circles relative to one circle (1→2 or 3).

The continuous variables that measured depression and emotional and material support were treated as the outcomes, and the box location was the independent variable in linear regression (i.e., ordinary least squares). If the outcome and independent variables were reversed (as was done for categorical variables), the coefficients would indicate how a one-unit change in the scale score affects the probability of moving from a lower to a higher risk box location (some scores ranged from 0 to 36). In contrast, treating box location as the independent variable showed the extent that the psychosocial scores changed by box location where being in zero circles was the reference group. Before selecting linear regression, we verified that the continuous variables conformed to a normal distribution with Wilkes-Shapiro tests and visual inspection of the histograms and Q-norm plots.

We did not conduct a multivariable analysis because this comprehensive set of variables has numerous marginal correlations that would be problematic for regression models.

Results

A total of 237 adolescents enrolled in the YWC intervention; Fig. 1 displays the frequencies of where the participants were categorized inside *the box*. Most participants ($n = 141$ [59.5%]) were not in any circles; 66 (27.8%) were in 1 circle, and 30 (12.7%) were in 2 or 3 circles.

Table 1 presents participant characteristics overall and stratified by box location. The mean ages across all box locations were between 17.6–17.9 years. The majority of participants (75.9%) had no men living in their household; the proportion was lowest for participants who were not in any circle (67.4%) and highest for those in 2 or 3 circles (92.4%). Of the

16 adolescents who lived with both parents, 15 were not in any circle. As expected, given the eligibility criteria (considered or dropped out of school), 65% of the sample was below the grade level for their age. Most participants had been tested for HIV (73%) and STIs (75.9%), including 90% of those in 2 or 3 intersecting circles.

Socioeconomic History

With the exception of having children (29.1% of the full cohort), the incremental odds of reporting low socioeconomic status increased by box location (Table 2 and Fig. 2a). Relative to adolescents in zero circles (26%), the participants in 1 (35%) or 2–3 (53%) circles (Fig. 2a) were 2.09 (95%CI (1.22, 3.57)) times as likely to have moved at least twice in the previous 6 months (Table 2). Participants in 1 or 2–3 circles were more than three times as likely as those who were not in any risk circle, to experience food insecurity (OR = 3.27, 95% CI (1.8, 5.94)), have a past arrest (OR = 3.56 (95%CI (2.08, 6.09)), and run away (OR = 3.3 95%CI (1.79, 6.10)). Past arrest was highly prevalent in this population overall (34%) (Table 2), but varied substantially by box locations including 23%, 44%, and 63% of participants in zero, 1, or 2–3 intersecting risk circles, respectively (Fig. 2a). Although about one fifth of the overall sample (22%) reported food insecurity (Table 2), the prevalence was 14%, 29%, and 43% in box locations zero, 1, or 2–3 intersecting risk circles, respectively (Fig. 2a).

Sexual Behaviors

The prevalence of sexual behaviors also reflected the box phenomenon (Fig. 2b). The prevalences of having sex with

Table 1 Characteristics of female adolescent participants, stratified by intersecting risk circles,^a Young Women’s CoOp study, Raleigh and Durham, NC 2010–2012

	Total Sample		Zero Circles		One Circle		2 or 3 Circles		<i>p</i> -value
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)	
Total sample	237	(100.0)	141	(59.5)	66	(27.8)	30	(12.7)	
Live with both parents	16	(6.8)	15	(10.6)	1	(1.5)	0	(0)	0.016
Single headed household – mother	83	(35.0)	51	(36.2)	27	(40.9)	5	(16.7)	0.054
No men in household	180	(75.9)	95	(67.4)	61	(92.4)	24	(80.0)	0.001
Below grade level for age	154	(65.0)	79	(56.0)	53	(80.3)	22	(73.3)	0.001
Ever tested for HIV	173	(73.0)	92	(65.2)	54	(81.8)	27	(90.0)	0.003
Ever tested for STI	180	(75.9)	95	(67.4)	58	(87.9)	27	(90.0)	0.001
	mean	(95% CI)	mean	(95% CI)	mean	(95% CI)	mean	(95% CI)	
Age at enrollment	17.6	(17.5 17.7)	17.6	(17.4 17.7)	17.6	(17.3 17.9)	17.9	(17.5 18.2)	0.52
Number adults in household	1.1	(1.02 1.24)	1.30	(1.15 1.44)	0.9	(0.75 1.13)	0.7	(0.44 1.03)	0.44

^a See Fig. 1 for definition of intersecting circles

Table 2 Bivariate ordinal and logistic odds ratios of sociodemographic, sexual behaviors, and history of abuse by box location^a

	<i>n</i>	(%)	Zero Circles	One Circle	2 or 3 Circles	Ordinal/ Logistic	(95% CI)	<i>p</i> -value
Total sample	237	(100.0)	<i>n</i>	<i>n</i>	<i>n</i>	OR		
Sociodemographic								
Teen mother	69	(29.1)	36	20	13	1.63	(0.94 2.82)	0.081
Moved ≥2 times in previous 6 months	76	(32.1)	37	23	16	2.09	(1.22 3.57)	0.007
Food insecurity	51	(21.5)	19	19	13	3.27	(1.80 5.94)	<0.0001
Ever arrested	80	(33.8)	32	29	19	3.56	(2.08 6.09)	<0.0001
Running away	48	(11.0)	18	17	13	3.30	(1.79 6.10)	<0.0001
Sexual Behaviors and Most Recent Partner								
> 1 partner in 30 days	49	(20.8)	20	16	13	2.97	(1.61 5.48)	<0.0001
Partner had other partners	47	(19.8)	22	14	11	2.10	(1.13 3.91)	0.037
Partner AOD use @ last sex	96	(40.5)	46	30	20	2.43	(1.45 4.08)	0.001
AOD @ last sex	71	(30.0)	33	12	21			
zero → 1						1.14	(0.58 2.23)	0.71
zero →2 or 3						7.64	(3.19 18.3)	<0.0001
1 →2 or 3						6.72	(2.59 17.5)	<0.0001
Condomless @ last vaginal sex	115	(48.5)	63	32	20			
zero → 1						1.17	(0.64 2.11)	0.609
zero →2 or 3						2.47	(1.08 5.67)	0.032
1 →2 or 3						2.13	(0.86 5.22)	0.100
Past and Current Abuse								
Physical	67	(28.4)	26	25	16			
zero → 1						2.67	(1.39 5.15)	0.003
zero →2 or 3						5.01	(2.18 11.5)	<0.0001
1 →2 or 3						1.87	(0.78 4.49)	0.158
Unwanted sexual touching	75	(32.1)	33	22	20			
zero → 1						1.70	(0.89 3.24)	0.108
zero →2 or 3						6.48	(2.76 15.23)	<0.0001
1 →2 or 3						3.82	(1.53 9.56)	0.004
Oral sex	26	(11.0)	6	11	9	5.31	(2.45 11.51)	<0.0001
Vaginal/anal sex	47	(19.9)	18	16	13	3.21	(1.73 5.96)	<0.0001
Emotional abuse current from partner	53	(25.5)	25	17	11			
zero → 1						1.79	(0.87 3.68)	0.113
zero →2 or 3						2.59	(1.08 6.21)	0.033
1 →2 or 3						1.45	(0.56 3.74)	0.446

^a See Fig. 1 for definition of box locations

two or more partners in the past 30 days were 14%, 24%, and 45% for box locations zero, 1, and 2–3 circles, respectively, corresponding to an increased odds of 2.97 (1.61, 5.48) (Table 2). Similarly, respondents suspecting that their partner had other partners increased in step with box location (OR = 2.10, [1.13, 3.91]). Because the proportional odds assumption was not met for alcohol or drug use at last sex, the incremental binomial odds ratios from logistic regression are presented (Table 2). Participants in 2–3 circles (70%) were 7.64 (3.19, 18.3) and 6.72 (2.59, 17.5) times as likely as those to use alcohol or drugs at their last sexual episode than participants

in zero or 1 circle, respectively. Self-report of not using condoms at the last vaginal sex was high across all box locations (45%, 49%, 67% for zero, 1, and 2–3 circles, respectively), and 2.47 (1.08, 5.67) times as likely among participants in the 2–3 circles as compared to zero circles.

Past and Current Abuse

Between 11% and 32% of all participants reported experiences of past physical or sexual abuse, or current emotional abuse from their main partner (Table 2). Figure 2c

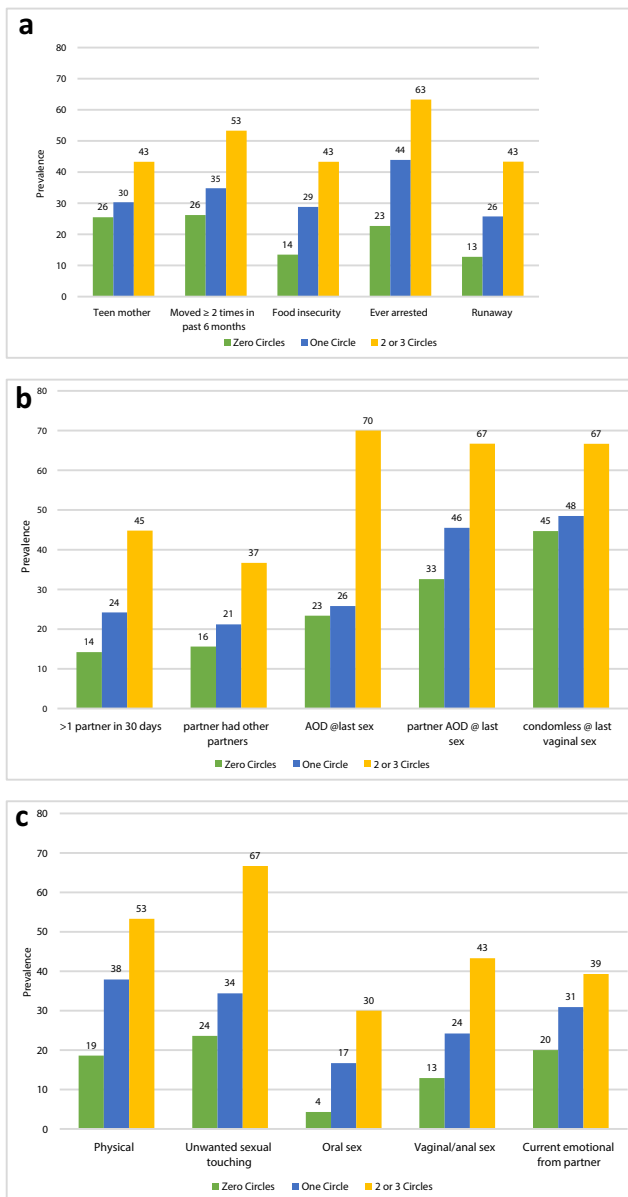


Fig. 2 a Distribution of socioeconomic factors by box location; b Distribution of sexual behaviors by box location; c Physical, sexual, and emotional abuse

illustrates that the prevalence of abuse varied substantially and increased for adolescents in each box location. Whereas 28% of the total sample reported past physical abuse, the prevalence was 19%, 38%, and 53% for participants in zero, 1, or 2–3 intersecting circles, respectively. Participants in 1 and 2–3 circles were 2.67 (1.39, 5.15) and 5.01 (2.18, 11.54) times as likely, respectively, as youth in zero circles to report physical abuse. Experiencing emotional abuse from their current partner was approximately 10 percentage points higher for each box position including 20%, 31%, and 39% for participants in zero, 1, and 2–3 circles, respectively (Fig. 2c). Respondents in 2–3 circles were

2.59 (1.08, 6.21) times as likely as those in zero circles to report current emotional abuse.

Psychosocial Assessments

Table 3 displays the mean scores and linear regression coefficients for emotional support, material support, and depression (where box location was the independent variable as explained in the analysis methods).

For the emotional support and material support scales, higher scores indicate increased support. The coefficients reflect the average reduction in support scores for being in 1 and 2–3 circles relative to being in zero circles. The average reduction in material support was –2.03 points (95%CI [–3.44, –0.62]) for youth in 1 circle, and –3.47 points (95%CI [–5.37, –1.57]) for 2–3 circles. Participants in 2–3 circles had a statistically significant reduction in emotional support of –2.43 points (95%CI [–4.31, –0.55]). The mean CES-D values score increased (indicating greater depression) with box location and was significantly higher among youth in 2–3 circles (2.51 points) (95% CI [0.47, 4.56]).

Neighborhood Violence and Crime

The majority of participants (85%) reported that they observed or were aware of violence and crime in their neighborhoods. Because 15% of participants reported no violence (and therefore had a score of zero), the distribution of scores was skewed thereby prohibiting performing linear regression. Figure 3 presents the prevalence of each item in the scale, stratified by box location. Most forms of violence were disproportionately distributed across box locations (Fig. 3) except for gun violence; 52% to 57% of respondents were aware of it occurring in their neighborhood. In general, the prevalence of violence and crime was markedly high for the entire cohort.

Discussion

This analysis sought to distill behaviors and other traumatic experiences typically paired in the literature with the terms “at risk” or “high risk” among African American female adolescents living in economically disadvantaged urban communities. The data originate from the baseline interview of a behavioral intervention for adolescents designed to reduce alcohol and drug use and sexual behaviors that place them at risk for sexually transmitted infections and pregnancy, and empower them to set personal positive goals.

Similar to Houck et al. [30], the eligibility criteria for this study were chosen to recruit youth who engaged in “high

Table 3 Bivariate linear regression of psychosocial measures by box location^a

	Descriptive Statistics			Linear Regression Models		
	Mean	Std. Err.	(95% CI)	Coefficient	(95% CI)	p-value
Material support						
total sample	18.6	0.32	(18.0 19.2)			
zero	19.6	0.42	(18.8 20.4)	ref		
1 circle	17.6	0.47	(16.6 18.5)	- 2.03	(- 3.44 - 0.62)	0.005
2–3 circles	16.1	1.04	(14.1 18.2)	- 3.47	(- 5.37 - 1.57)	< 0.0001
Emotional support						
total sample	21.3	0.31	(20.7 21.9)			
zero	21.8	0.40	(21.0 22.5)	ref		
1 circle	21.2	0.54	(20.2 22.3)	- 0.54	(- 1.93 0.86)	0.448
2–3 circles	19.3	1.01	(17.3 21.4)	- 2.43	(- 4.31 - 0.55)	0.012
Depression screener (CESD)						
total sample	9.5	0.34	(8.9 10.2)			
zero	8.8	0.43	(7.9 9.6)	ref		
1 circle	10.3	0.64	(9.0 11.5)	1.50	(- 0.01 3.02)	0.052
2–3 circles	11.3	1.00	(9.4 13.2)	2.51	(0.47 4.56)	0.016

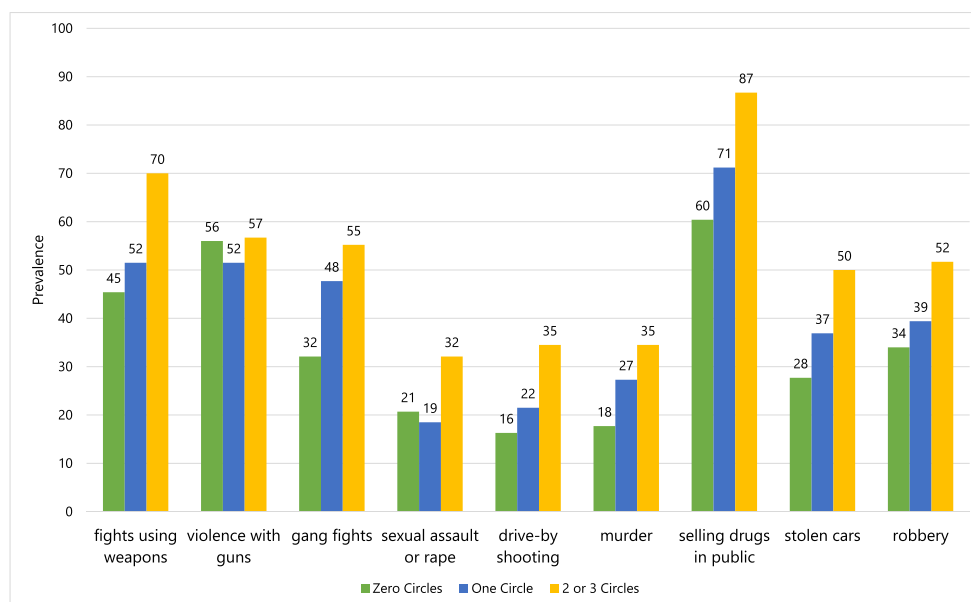
^a See Fig. 1 for definition of box locations

risk” behaviors and who may have experienced traumatic or stressful events that placed them “at risk” for poor social and health outcomes. Houck et al. [30] then used latent class analysis to condense the data and classify their sample of “high risk” youth into three groups of *variable risk*. Although latent class analysis is statistically rigorous and unbiased, we chose a different approach that was hypothesis-driven to create “the box” on the basis of three

intersecting and extremely adverse experiences. Then, the statistical analysis leveraged the ordered nature of the data (i.e., box location).

The largest proportion of participants was not in any intersecting risk circles (59%), which is a somewhat promising finding. That said, the prevalence of traditionally conceived risk factors was elevated for all participants, as expected given the eligibility criteria. Additionally,

Fig. 3 Neighborhood violence and crime



recruitment took place in underserved neighborhoods. Thus, these young women were “in the box of risk,” whereas the adolescents in the intersecting circles were classified as such if they had reported especially traumatic outcomes: ever been homeless or ever traded sex, or smoked marijuana at least 70 of the 90 previous days and drank alcohol excessively.

The study and analysis have limitations. Social desirability bias may have underestimated the extent of poor outcomes and behaviors. However, the more sensitive questions were self-administered via ACASI to lower the likelihood of this type of bias [39]. Also, the prevalence of affirmative responses to sensitive questions about proscribed behaviors was high. The survey did not measure parental monitoring, which mitigates the likelihood of risk behaviors and delinquency [40, 41]. The sample size was somewhat small. Multiple comparisons and statistical tests may have produced associations that were random noise. Nevertheless, the results show a consistent pattern and generally lead to the same inference that African American female adolescents classified into intersecting circles disproportionately experienced higher prevalence of poor outcomes.

We presented a creative use of traditional risk factor variables to describe a sample of African American adolescents in the southeastern USA. The box classification accounts for the interrelationships among these variables and clearly illuminates how some youth are “in risk” while others are at “high risk.” The findings for emotional and material support were compelling as they revealed that youth who have people in their lives who can help and support them suggest an alternative entry point of interventions that cultivates positive relationships [28, 42]. Thus, interventions designed to help underserved African American youth may not achieve optimal success unless the diverse circumstances occurring at multiple levels and experiences are addressed. Programs that serve adolescents should continue to harness what is good and change the dialogue from vague use of “high risk” to positive language with a focus on youth development and support—i.e., asset or strength-based approach with technology driven methods that may resonate with them.

Acknowledgments We acknowledge Rachel Middlesteadt Ellerson’s successful efforts to coordinate the project at two study locations, train and supervise study staff, and ensure that young women complete the study. We also wish to thank Alliance of AIDS Services – Carolina for its partnership in this project.

Author Contributions WM Wechsberg was the principal investigator, conceived the study design, and oversaw all data collection and execution of intervention. FB Browne contributed to design of interventions and data collection. IA Doherty conducted all data analysis and wrote the

initial drafts of the manuscript. All authors contributed to writing and editing and approved the final manuscript.

Funding Information The research described in this article was conducted with support from the Centers for Disease Control and Prevention Cooperative Agreement (5UR6PS000665; Principal Investigator: WM Wechsberg, PhD). Preparation of the manuscript was funded in part by the RCMI Center for Health Disparities at North Carolina Central University (NIMHD 5U54MD012392; Principal Investigator: D Kumar, PhD).

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflicts of interest.

Ethical Approval All procedures performed in the studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (IRB at RTI International) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

This article does not contain any studies with animals performed by any of the authors.

Informed Consent Informed consent was obtained from all individual participants included in the study.

References

1. Bowen GL, Chapman MV. Poverty, neighborhood danger, social support, and the individual adaptation among at-risk youth in urban areas. *J Fam Issues*. 1996;17(5):641–66. <https://doi.org/10.1177/019251396017005004>.
2. Sales JM, Brown JL, Vissman AT, Di Clemente RJ. The association between alcohol use and sexual risk behaviors among African American women across three developmental periods: a review. *Curr Drug Abuse Rev*. 2012;5(2):117–28.
3. Brawner BM, Gomes MM, Jemmott LS, Deatrick JA, Coleman CL. Clinical depression and HIV risk-related sexual behaviors among African-American adolescent females: unmasking the numbers. *AIDS Care*. 2012;24(5):618–25. <https://doi.org/10.1080/09540121.2011.630344>.
4. Seth P, Patel SN, Sales JM, DiClemente RJ, Wingood GM, Rose ES. The impact of depressive symptomatology on risky sexual behavior and sexual communication among African American female adolescents. *Psychol Health Med*. 2011;16(3):346–56. <https://doi.org/10.1080/13548506.2011.554562>.
5. Yoder KA, Whitbeck LB, Hoyt DR. Gang involvement and membership among homeless and runaway youth. *Youth Soc*. 2003;34(4):441–67. <https://doi.org/10.1177/0044118x03252585>.
6. Browne FA, Wechsberg WM, White VM, Ellerson RM, Raiford JL, Carry MG, et al. The influence of social determinants on sexual risk among out-of-school African American female adolescents. *Vulnerable Child Youth Stud*. 2014;9(2):139–50. <https://doi.org/10.1080/17450128.2013.832828>.
7. Crosby RA, DiClemente RJ, Wingood GM, Salazar LF, Rose E, Sales JM. The protective value of school enrollment against sexually transmitted disease: a study of high-risk African American adolescent females. *Sex Transm Infect*. 2007;83(3):223–7. <https://doi.org/10.1136/sti.2006.022590>.
8. Turner AK, Latkin C, Sonenstein F, Tandon SD. Psychiatric disorder symptoms, substance use, and sexual risk behavior among

- African-American out of school youth. *Drug Alcohol Depend.* 2011;115(1–2):67–73. <https://doi.org/10.1016/j.drugalcdep.2010.10.012>.
9. Liverpool J, McGhee M, Lollis C, Beckford M, Levine D. Knowledge, attitudes, and behavior of homeless African-American adolescents: implications for HIV/AIDS prevention. *J Natl Med Assoc.* 2002;94(4):257–63.
 10. Morton MH, Dworsky A, Matjasko JL, Curry SR, Schlueter D, Chavez R, et al. Prevalence and correlates of youth homelessness in the United States. *J Adolesc Health.* 2018;62(1):14–21. <https://doi.org/10.1016/j.jadohealth.2017.10.006>.
 11. Harper GW, Robinson WL. Pathways to risk among inner-city African-American adolescent females: the influence of gang membership. *Am J Community Psychol.* 1999;27(3):383–404. <https://doi.org/10.1023/A:1022234027028>.
 12. Voisin DR, King KM, Diclemente RJ, Carry M. Correlates of gang involvement and health-related factors among African American females with a detention history. *Child Youth Serv Rev.* 2014;44:120–5. <https://doi.org/10.1016/j.childyouth.2014.05.001>.
 13. Wingood GM, DiClemente RJ, Crosby R, Harrington K, Davies SL, Hook EW 3rd. Gang involvement and the health of African American female adolescents. *Pediatrics.* 2002;110(5):e57. <https://doi.org/10.1542/peds.110.5.e57>.
 14. Vagi KJ, Rothman EF, Latzman NE, Tharp AT, Hall DM, Breiding MJ. Beyond correlates: a review of risk and protective factors for adolescent dating violence perpetration. *J Youth Adolesc.* 2013;42(4):633–49. <https://doi.org/10.1007/s10964-013-9907-7>.
 15. Baron SW. Street youth violence and victimization. *Trauma Violence Abuse.* 2003;4(1):22–44.
 16. Rivera PM, Bray BC, Guastaferro K, Kugler K, Noll JG. Linking patterns of substance use with sexual risk-taking among female adolescents with and without histories of maltreatment. *J Adolesc Health.* 2018;62(5):556–62. <https://doi.org/10.1016/j.jadohealth.2017.11.293>.
 17. Hong JS, Voisin DR, Kim JW, Allen-Meares P, Espelage DL. Pathways from peer victimization to sexual risk-taking behavior among African American adolescents in Chicago's Southside. *Psychol Violence.* 2019;9(1):88–97. <https://doi.org/10.1037/vio0000164>.
 18. Brown LK, Tolou-Shams M, Lescano C, Houck C, Zeidman J, Pugatch D, et al. Depressive symptoms as a predictor of sexual risk among African American adolescents and young adults. *J Adolesc Health.* 2006;39(3):444. e1–8.
 19. McGee ZT, Richeson B, Ducoste M, Jones C, Nunn T. A correlational study of the relationship between risk factors and gun-related delinquency among urban female adolescents. *Youth Voice J.* 2018;8:2056–969.
 20. Liu RT, Mustanski B. Suicidal ideation and self-harm in lesbian, gay, bisexual, and transgender youth. *Am J Prev Med.* 2012;42(3):221–8.
 21. Swartzendruber A, Niccolai LM, Jennings JM, Zenilman JM, Divney AA, Magriples U, et al. Perceptions about sexual concurrency and factors related to inaccurate perceptions among pregnant adolescents and their partners. *Sex Transm Dis.* 2012;39(8):577–82. <https://doi.org/10.1097/OLQ.0b013e318253629c>.
 22. Seth P, Wingood GM, DiClemente RJ, Robinson LS. Alcohol use as a marker for risky sexual behaviors and biologically confirmed sexually transmitted infections among young adult African-American women. *Womens Health Issues.* 2011;21(2):130–5. <https://doi.org/10.1016/j.whi.2010.10.005>.
 23. Copeland-Linder N, Lambert SF, Chen YF, Ialongo NS. Contextual stress and health risk behaviors among African American adolescents. *J Youth Adolesc.* 2011;40(2):158–73. <https://doi.org/10.1007/s10964-010-9520-y>.
 24. Corneille MA, Belgrave FZ. Ethnic identity, neighborhood risk, and adolescent drug and sex attitudes and refusal efficacy: the urban African American girls' experience. *J Drug Educ.* 2007;37(2):177–90. <https://doi.org/10.2190/UJ17-34J7-U306-2822>.
 25. Francois S, Overstreet S, Cunningham M. Where we live: the unexpected influence of urban neighborhoods on the academic performance of African American adolescents. *Youth Soc.* 2012;44(2):307–28. <https://doi.org/10.1177/044118x11399109>.
 26. Petering R. Sexual risk, substance use, mental health, and trauma experiences of gang-involved homeless youth. *J Adolesc.* 2016;48:73–81. <https://doi.org/10.1016/j.adolescence.2016.01.009>.
 27. Like TZ, Cobbina JE. Emotional girls and rational boys: the gendering of violence among urban. *Afr Am Youth Crime Delinq.* 2019;65(3):295–321. <https://doi.org/10.1177/0011128718811002>.
 28. Li ST, Nussbaum KM, Richards MH. Risk and protective factors for urban African-American youth. *Am J Community Psychol.* 2007;39(1–2):21–35. <https://doi.org/10.1007/s10464-007-9088-1>.
 29. Swahn MH, Bossarte RM. Assessing and quantifying high risk: comparing risky behaviors by youth in an urban, disadvantaged community with nationally representative youth. *Public Health Rep.* 2009;124(2):224–33. <https://doi.org/10.1177/003335490912400210>.
 30. Houck CD, Lescano CM, Brown LK, Tolou-Shams M, Thompson J, Diclemente R, et al. "Islands of risk": subgroups of adolescents at risk for HIV. *J Pediatr Psychol.* 2006;31(6):619–29. <https://doi.org/10.1093/jpepsy/jsj067>.
 31. Hallfors DD, Iritani BJ, Miller WC, Bauer DJ. Sexual and drug behavior patterns and HIV and STD racial disparities: the need for new directions. *Am J Public Health.* 2007;97(1):125–32. <https://doi.org/10.2105/AJPH.2005.075747>.
 32. Raiford JL, Herbst JH, Carry M, Browne FA, Doherty I, Wechsberg WM. Low prospects and high risk: structural determinants of health associated with sexual risk among young African American women residing in resource-poor communities in the south. *Am J Community Psychol.* 2014;54(3–4):243–50. <https://doi.org/10.1007/s10464-014-9668-9>.
 33. Farley TA. Sexually transmitted diseases in the Southeastern United States: location, race, and social context. *Sex Transm Dis.* 2006;33(7):S58–64.
 34. Wechsberg WM, Browne FA, Zule WA, Novak SP, Doherty IA, Kline TL, et al. Efficacy of the young Women's CoOp: an HIV risk-reduction intervention for substance-using African-American female adolescents in the south. *J Child Adolesc Subst Abuse.* 2017;26(3):205–18. <https://doi.org/10.1080/1067828X.2016.1260511>.
 35. CDC. PS07–004: Adopting and demonstrating the adaptation of prevention techniques for persons at highest risk of acquiring or transmitting human immunodeficiency virus (ADAPT 2) - (UR6). Atlanta, GA: Centers for Disease Control and Prevention 2007.
 36. Wechsberg WM, Doherty IA, Browne FA, Kline TL, Carry MG, Raiford JL, et al. Gang membership and marijuana use among African American female adolescents in North Carolina. *Subst Abuse Rehabil.* 2015;6:141–50. <https://doi.org/10.2147/SAR.S93304>.
 37. Babor T, Biddle-Higgins JC, Saunders JB, Monteiro MG. AUDIT: the alcohol use disorders identification test: guidelines for use in primary health care. 2001.
 38. Radloff LS. The CES-D scale a self-report depression scale for research in the general population. *Appl Psychol Meas.* 1977;1(3):385–401.
 39. Turner CF, Ku L, Rogers SM, Lindberg LD, Pleck JH, Sonenstein FL. Adolescent sexual behavior, drug use, and violence: increased reporting with computer survey technology. *Science.* 1998;280(5365):867–73. <https://doi.org/10.1126/science.280.5365.867>.
 40. Yang HM, Stanton B, Li XM, Cottrel L, Galbraith J, Kaljee L. Dynamic association between parental monitoring and

- communication and adolescent risk involvement among African-American adolescents. *J Natl Med Assoc.* 2007;99(5):517–24.
41. Dittus PJ, Michael SL, Becasen JS, Gloppen KM, McCarthy K, Guilamo-Ramos V. Parental monitoring and its associations with adolescent sexual risk behavior: a meta-analysis. *Pediatrics.* 2015;136(6):e1587–99. <https://doi.org/10.1542/peds.2015-0305>.
 42. Hurd N, Zimmerman M. Natural mentors, mental health, and risk behaviors: a longitudinal analysis of African American adolescents transitioning into adulthood. *Am J Community Psychol.* 2010;46(1–2):36–48. <https://doi.org/10.1007/s10464-010-9325-x>.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.