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The association between perceived community violence, police bias, race, and firearm carriage among urban adolescents and young adults

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Dr. Cunningham, Dr. Resnicow, and Dr. Walton advised the analyses and contributed to manuscript writing and editing.

Ms. Steiger co-developed the present study aims and contributed to manuscript writing.

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Dr. Carter led the concept and data collection of the Project IntERact sample, advised the development of the present study aims, advised the analyses, and contributed to manuscript writing and editing.

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Abstract

Firearms are the leading cause of death among young adults. Given community violence is an important correlate of youth firearm carriage, we evaluated: 1) If the association between perceived community violence and firearm carriage is stronger when perceived police bias is greater; and 2) If this moderated association differs by race. Cross-sectional data came from screening data for a longitudinal study of firearm behaviors among young adults seeking urban emergency department treatment between July 2017-June 2018 ($N=1,264$). We estimated Poisson regressions with robust error variance to evaluate associations between perceived community violence, police bias, race, and firearm carriage. Community violence was positively associated with firearm carriage (average marginal effect [AME]: 0.05; 95% Confidence Interval [CI]: 0.03, 0.07). We also found that the positive association between community violence and firearm carriage increased with higher perceptions of police bias (interaction $p<.05$). We did not find evidence of a three-way interaction by which the moderated association between violence exposure and firearm carriage by perceived police bias varied by race of the respondents. Our findings suggest that community-level strategies to reduce violence and police bias may be beneficial to decrease youth firearm carriage in socio-economically disadvantaged urban settings.

Keywords

firearm; police; violence prevention

Introduction

Firearms are the leading cause of death for adolescents and emerging adults (age 16-24), with 66% of all violence-related deaths in this age group resulting from firearms.¹ Non-fatal firearm injuries result in an additional 46,000 estimated emergency department (ED)

visits annually.² Youth involved in firearm violence have elevated rates of negative health outcomes, including assault injuries,^{3,4} future firearm violence involvement,^{4,5} substance use disorders,⁶ mental health issues (e.g., anxiety, depression, PTSD),⁷ and criminal justice involvement.^{4,8} An important precursor to firearm violence is firearm carriage. Cross-sectional and longitudinal research show that firearm carriage is associated with higher risk firearm behaviors (e.g., firearm aggression against peers/partners),^{5,9} as well as increased risk for serious or fatal injury.^{10–15} Understanding the circumstances under which youth and emerging adults carry firearms can be an important step towards curbing firearm deaths in this age group.

Firearm carriage and community violence exist together in a synergistic association.^{16–18} An individual might be motivated to carry a firearm for self-protection in communities with high violence exposure,¹⁹ and carriage in such contexts can beget more violence and injury.^{10–14} In these settings, minor altercations can escalate to lethal violence in the presence of a firearm. This elicits the question: Under what circumstances might an individual feel more or less compelled to carry a firearm? Researchers have consistently found that community violence exposure poses a threat to individual safety.^{9,16,20,21} Yet, we understand little about the context under which an individual may feel a reduced or heightened need to rely on oneself for protection and safety in settings with ongoing violence, and thereby carry a weapon.

Procedural Justice Theory²² suggests that perceptions of police bias may moderate the association between perceived community violence exposure and youth firearm carriage. Procedural Justice Theory is a framework that has been applied to policing that focuses on how the subjective process of a community's interaction with law enforcement (i.e., fairness and dignity) is more predictive of perceptions of police than the specific satisfaction with the outcomes of interactions (i.e., arrested or remained free).²³ Procedural justice in a policing context includes trust in police motivations, perceived fairness in treatment, respectful interpersonal encounters, and voice/participation during the encounter.^{22–24} When any of these components are compromised, police legitimacy within the community is decreased.^{24–26} Informed by Procedural Justice Theory, we hypothesize that the positive association between perceived community violence and firearm carriage is strengthened among individuals who perceive the police are biased, as individuals may feel that they cannot trust police to protect them, and so must protect themselves. Stated another way, cynicism in law enforcement—or perceiving police are illegitimate, unresponsive, and ill-equipped to ensure public safety^{27,28}—may motivate the carriage of a firearm for protection.

This hypothesized moderated association—whereby the association between perceived community violence and firearm carriage is stronger when perceived police bias is greater—may differ across racial groups. Distrust of police may be a result of structural racism that underlies unfair treatment, unconscious bias, and police brutality in communities of color.²⁹ Black Americans thus tend to have more negative perceptions of police than White Americans, on average.^{25,26} Although many White Americans are aware (or becoming aware) of the presence of police racial bias,^{30–32} the negative repercussions of non-responsive or biased police are higher for non-White citizens. Minority populations,

particularly Black Americans, have disproportionately experienced police violence,^{33,34} and Black men are more than 2.5 times more likely to be killed by police over their lifetime compared to White men.³⁴ White citizens, even if they have negative perceptions of police, may still be able to rely on police for some level of protection. Thus, we further hypothesize that the proposed moderated association between perceived community violence, perceived police bias, and firearm carriage is stronger for individuals who identify as Black compared to non-Black. Moreover, historic and present racist policies—including those that result in economic and political disenfranchisement—have resulted in predominately Black neighborhoods experiencing both socio-demographic inequity and heightened violence.^{35,36} It is also within these neighborhoods that police are potentially more likely to engage in behaviors that shatter trust, such as occupational misconduct, coercion, and lethal force.^{24,25} Thus, negative perceptions of police may strengthen the relationship between community violence exposure and firearm carriage to a greater extent among Black compared to non-Black citizens. To elaborate, non-Black citizens may believe that police are biased, but Black citizens are more likely to be directly affected by police bias, including racial disparities in arrests and victimizations by police violence (e.g., shootings).^{31,32}

Given the significant risk that firearms pose to youth, we estimated multivariate Poisson regression models with robust error variance using cross-sectional data from a sample of young adults in an urban emergency department to address the following research hypotheses:

1. The association between perceived community violence and firearm carriage is stronger in the presence of higher levels of perceptions of police bias; and
2. This moderated association differs by race, such that the moderation of the relationship between perceived community violence and firearm carriage by perceptions of police bias is stronger for Black citizens as compared to non-Black citizens.

Methods

Study sample.

In the present study, we used cross-sectional screening data from a larger intensive longitudinal daily data study of firearm behaviors among adolescents and young adults seeking urban emergency department (ED) treatment in Flint, Michigan.⁹ Flint has elevated rates of crime and poverty³⁷ comparable to other de-industrialized urban centers in the United States. The University of Michigan and Hurley Medical Center (HMC) Institutional Review Boards approved study procedures, and the study team obtained an NIH certificate of confidentiality.

The study team approached individuals aged 16–29 years who presented to HMC ED for any reason between July 2017 and June 2018 to participate in the study. Exclusion criteria included presentation for sexual assault, child maltreatment, suicidal ideation/attempt, serious mental illness (e.g., schizophrenia), or cognitive impairment precluding consent (e.g., intoxication). The study also excluded participants in active police custody (n=14). Recruitment proceeded 7 days/week (2:00 pm–12:00 am). Following written consent (and/or

assent with parental/guardian consent if age < 18), patients self-administered a private computerized survey. Participants received a dollar store gift (~\$1 value) for participation in the screening assessment. In total, 1,311 individuals completed the cross-sectional screening assessment that are the data source for this study. The study flowchart and sample characteristics have been previously published in full;⁹ we present the flowchart in Figure 1 for the analytic sample.

Measures.

Outcome: Firearm carriage.—To assess recent firearm carriage, the survey asked participants: “In the past 3 months, including today, how many times have you carried a gun with you when you were outside your home, including in your car? This includes times that you’ve carried a gun for hunting, target shooting, or for work purposes.”³⁸ Response options ranged from *Never* to *20+ times*. We developed a dichotomous variable of firearm carriage which indicated if the respondent had carried a firearm one or more times in the prior three months (as opposed to never carrying in the prior three months).

Exposure: Perceived Community Violence Exposure.—We assessed perceived community violence exposure using summary scores from twelve items from the “Things I Have Seen and Heard” survey (range 0-36),³⁹ which evaluated how many times an individual has seen different types of violence (e.g., someone beaten up, chased by a gang, stabbed) in their neighborhood in the past three months. This measure had high internal consistency in our sample (Cronbach’s $\alpha=0.93$).

Moderator: Perceptions of Police.—Perceptions of police reflected a summary score of seven items from the Perceptions of Police Scale⁴⁰ that assessed the degree to which individuals agreed with various statements regarding general attitudes toward police and perceptions of bias (e.g., police officers treat all people fairly; the police do not discriminate), with responses ranging from 0 (strongly agree) to 4 (strongly disagree). Higher scores reflected stronger perceptions of bias in law enforcement (range 0-28). This measure had high internal consistency in our sample (Cronbach’s $\alpha=0.95$).

Control variables.—We identified potential confounders in the association of community violence exposure with firearm carriage using a directed acyclic graph (DAG).^{41–43} In creating the DAG, we specified associations among variables using our subject matter expertise and existing empirical evidence. Based on our analysis of the DAG (Supplemental Figure 1), our minimally sufficient adjustment set to adjust for potential confounding included gender (male, female, transgender/non-binary/other), age (range 16-29 years), if the respondent and/or their parents receive any type of public assistance (yes or no), ethnicity (Hispanic or non-Hispanic), and race (Black, White, Multi-racial or other, American Indian or Alaska Native, Middle Eastern, Asian, Native Hawaiian or other Pacific Islander). The sample primarily identified as Black (51%) or White (40%). To facilitate moderation analyses, we dichotomized race into Black versus non-Black.

Additional descriptive variables.—The study team collected information regarding reason for ED visit (dichotomized into violent injury versus not violent injury). Participants

also reported the primary reason for firearm possession using a modified item from the National Survey of Weapon-Related Experiences, Behaviors, and Concerns of High School Youth.³⁸ For each type of firearm that an individual possessed (i.e., owned and/or carried), they reported the primary reason for having that type of firearm. Response options included: to protect myself, my family, or my friends; for hunting or sporting activities; I was holding it for someone; to get back at someone for revenge; because most of my friends carry guns; to sell it to someone; required to have a gun for my job; other. Given our focus on the self-protection model of firearm carriage, we determined the proportion of individuals who reported carrying a firearm in the prior three months who stated their primary motivation for carrying/owning at least one of their firearms was ‘to protect myself, my family, or my friends.’

Statistical analysis.

We examined the relative risk of community violence exposure on firearm carriage with multivariable Poisson regression models with robust error variance,⁴⁴ using all participants with complete and known data on each predictor ($n = 1,264$; 96% of all participants). We were centrally interested in exploring: 1) if the association between perceived community violence and firearm carriage was stronger in the presence of higher levels of perceptions of police bias; and 2) if this moderated association differed by race. We performed data cleaning in R version 4.1.1 and analyses in Stata SE version 16.1.

To address our first research hypothesis regarding perceptions of police bias moderating the relationship between perceived community violence and firearm carriage, our first model regressed perceived community violence exposure, perceptions of police, and control variables on firearm carriage, including an interaction between perceived community violence exposure and perceptions of police. To address our second research hypothesis regarding if this moderated association differed by race, in the second model, we added a three-way interaction between community violence, perceptions of police, and race, and all lower-order interaction terms (i.e., an interaction between race and community violence, and an interaction between race and perceptions of police). We conducted a likelihood ratio test to assess if model fit improved between the first and second model. An improvement in model fit would suggest evidence for the presence of a three-way interaction between race, perceptions of police bias, and perceived community violence), whereas no improvement in model fit would suggest no evidence for the presence of a three-way interaction between race, and the first model (i.e., two-way interaction between perceived community violence and perceptions of police) would be the final model. We report adjusted relative risk (aRR) in addition to average marginal effects (AME) for all covariates, using the observed values for each participant to compute predicted probabilities.⁴⁵ AME is the difference in average predicted probability of firearm carriage between the group of interest and the referent group (for categorical variables) or the difference in average predicted probability of firearm carriage associated with a one-unit increase in the variable of interest (for continuous variables), expressed as a proportion (e.g., an AME of + 0.05 indicates a 5-percentage point difference in predicted probabilities). We probed the nature of interactions by obtaining adjusted predictions and AMEs at representative values of the moderator.⁴⁵ We standardized perceptions of police and community violence exposure, and we mean-centered all other

continuous variables in our analytic models. Analyses showed no variance inflation factors above 1.71, indicating no harmful multicollinearity.

Results

Descriptive statistics for the full analytic sample are summarized in Table 1. Briefly, 14% of the sample carried a firearm in the prior three months, 51% identified as Black, 29% identified as male, and average age was 22 ($SD=3.7$) years. Among non-Black participants, Eight percent of respondents were treated in the ED for a violent injury. Among individuals who reported carrying a firearm in the prior three months ($n=177$), 71% stated their primary motivation for carrying/owning at least one of their firearms was ‘to protect myself, my family, or my friends.’

Model fit did not significantly improve upon adding a three-way interaction between community violence, perceptions of police, and race, and all lower-order interaction terms ($\chi^2[3, N=1,264]=7.13, p=0.07$). Thus, we did not retain the three-way interaction term in our final multivariable Poisson regression model, and so we interpret results from our first model that regressed perceived community violence exposure, perceptions of police, and control variables on firearm carriage, including an interaction between perceived community violence exposure and perceptions of police.

Table 2 provides the results from our final model. Community violence was positively associated with firearm carriage (AME: 0.05; 95% Confidence Interval [CI]: 0.03, 0.07). We found a significant interaction between community violence and perceptions of police bias in the association with firearm carriage (aRR: 1.12; 95% CI: 1.01-1.23). Decomposing the nature of this interaction, the positive association between community violence and firearm carriage increased with higher levels of perceptions of police bias (Figure 2). For example, at low perceptions of police bias (i.e., one standard deviation below the mean), the AME of a one-standard deviation increase in perceptions of community violence was a 2.7 percentage point increase in the predicted probability of firearm carriage (AME: 0.027; 95% CI: 0.006-0.050). This AME rose to a 4.5 percentage point increase (AME: 0.045; 95% CI: 0.028-0.061) and 6.7 percentage point increase (AME: 0.067; 95% CI: 0.048-0.085) in the predicted probability of firearm carriage at average (i.e., at the mean) and high levels (i.e., one standard deviation above the mean) of perceptions of police bias, respectively. Men were also more likely to carry a firearm compared to women (AME: 0.12; 95% CI: 0.08, 0.17), but no other covariates were associated with firearm carriage.

Discussion

Our results are consistent with Procedural Justice Theory as evidenced by our finding that perceptions of police bias amplified the association between perceived community violence exposure and firearm carriage among adolescents and emerging adults presenting in an urban ED. This finding supports our first hypothesis and the notion of legal cynism.²⁷ Specifically, an individual is more likely to carry a firearm if they perceive greater levels of community violence, and this association is stronger if the individual does not trust the police to protect them against such violence. Conversely, community trust in policing may

result in greater cooperation and less suspicion during encounters with officers, which may also result in being less likely to feel that one must carry a firearm for self-protection.

Our results are further strengthened by the fact that the measure of perceptions of police captures the four components of Procedural Justice Theory in the context of policing (i.e., trust, perceived fairness, respectful encounters, voice).^{22–24} Police legitimacy is compromised when these components are absent or lessened in some way, as what happens for Black people encountering police who are racial profiling. Unfair treatment during police encounters can result in noncompliance, contempt, and withdrawal from voluntary participation with law enforcement.⁴⁶ Such encounters begin the spiral of decreased police legitimacy, which results in police distrust and the notion of being victimized rather than protected by the police.^{24–26} This may then translate to a perceived need to carry firearms for protection.

Alternatively, perceptions of police bias and perceived community violence exposure might reflect an underlying general sense of anger or unfairness within an individual that may also lead to firearm carriage. In other words, rather than perceptions of police bias in the presence of community violence interacting to increase the likelihood of firearm carriage, individual attitudes might independently result in greater perceived violence, perceived bias, and likelihood for firearm carriage. Additionally, individuals' perceptions about the police's ability to protect—independent of perceived bias—may influence the likelihood of firearm carriage. In the present analyses, we conceptualized the perceptions of police scale as an assessment of perceptions of police bias. Belief in law enforcement's ability to provide safety, however, is likely also a key facet to consider in the association between police perceptions and firearm carriage.

We did not find evidence for our second hypothesis as we found no three-way interaction by which the moderated association between perceived community violence exposure and firearm carriage by perceptions of police bias was different for individuals who identify as Black compared to non-Black. This was surprising because perceptions of police bias are steeped in historical and contemporary relationships between police and communities. Police have been shown to be more likely to engage in behaviors that shatter trust—such as occupational misconduct, coercion, and lethal force—in predominately Black and low-income neighborhoods.^{24,25,47} Thus, improving relations between police and community members, particularly racial and ethnic minority community members, is a complex problem that likely requires various systemic policy and practice changes, including by police, and such changes may have downstream effects on reducing firearm carriage. The city in which this study took place—Flint, Michigan—was one of the first places where community policing was developed and tested,⁴⁸ and continues today, which may explain why findings did not support our second hypothesis that the moderated relationship between perceived community violence and firearm carriage by perceptions of police bias would differ by race.

Community policing efforts may be one strategy to improve relations between police and community members,⁴⁸ and likewise, reduce community violence and firearm carriage. Community policing initiatives focus on proactive strategies—rather than reactive methods—to curb crime.^{49,50} Such initiatives require collaboration between the police and

community members to identify and solve community problems; likewise, all members of the community become active allies in the effort to enhance the safety and quality of neighborhoods.^{49,51} Evidence suggest that community policing may not only improve relations between police and community members, but it may also reduce citizen perceptions of disorder and fear of crime,^{52,53} in addition to reducing crime in some applications.⁵⁴ Thus, community policing may be a strategy by which to reduce both perceptions of police bias and perceived community violence, thereby reducing community members' motivations to carry a firearm for protection. In addition, community level approaches shown to reduce adolescent exposure to firearm violence (e.g., neighborhood greening), may also serve to reduce the underlying motivations that lead to firearm carriage among high-risk youth.^{55,56} Finally, these community-level interventions could be combined with individual-level youth violence interventions which reduce youth violence involvement,^{57,58} although effects specifically on firearm carriage remains an active area of research.

Strengths and Limitations

Although our study included a large sample of adolescents and young adults from a socio-economically disadvantaged urban community, several limitations should be noted. First, our analyses are cross-sectional and subject to unmeasured confounders and reverse-causation. Thus, we are unable to infer causation. We also do not know if individuals carry a firearm to make up for the perceived lack of trust that the police will be helpful for protecting them from being victimized in their community, or if individuals have a firearm to protect themselves against the police. Although the data were collected in 2017-2018, police violence against Black and Brown communities has unfortunately been consistently high in the time between data collection and publication,⁵⁹ giving reason to the idea that study findings may generalize to the present. Future qualitative research could investigate motives behind firearm ownership in this population. Another limitation is that the data are from a single urban ED, and results may not generalize to dissimilar samples from rural or suburban settings. The sample also represents individuals who sought medical care in the community. Yet, our results do support Procedural Justice Theory and may be particularly relevant for urban sample. Although respondents were predominately women, the data do reflect the racial and economic characteristics of the Flint population.⁹ Replication of results among samples from other cities and from suburban and rural settings not studied would be useful. Additionally, the Perceptions of Police scale utilized in the present study reflects normative beliefs about the police and may not fully reflect an individual's personal encounters with police and police bias. Our results, however, suggest that future research that investigates how the association between community violence exposure and firearm carriage changes depending on an individual's actual encounters with law enforcement would be informative. We did not find evidence for our second hypothesis as we found no three-way interaction by which the moderated association between perceived community violence exposure and firearm carriage by perceptions of police bias was different for individuals who identify as Black compared to non-Black. This finding, however, may be a result of our sample being too small to provide the power necessary to detect a small interaction effect. Finally, given the vast majority of our sample identified as Black or White, and we had very few respondents who identified as Hispanic, we were not able to investigate how the moderated

relationship between perceived community violence and firearm carriage by perceptions of police may differ among other racial and ethnic minorities.

Conclusions

The association between perceived community violence and firearm carriage is strongest in the presence of perceptions of police bias in high-crime urban settings. Our results suggest that efforts to reduce police bias and programs for community-level violence prevention would be helpful to reduce youth firearm carriage in these settings and help address the firearm injury epidemic we are experiencing in the United States today.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Conflict of interest statement:

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Community violence was associated with gun carriage among our sample of young adults

Perceived police bias strengthened the link between community violence and gun carriage

Strategies to reduce violence and police bias may decrease youth firearm carriage

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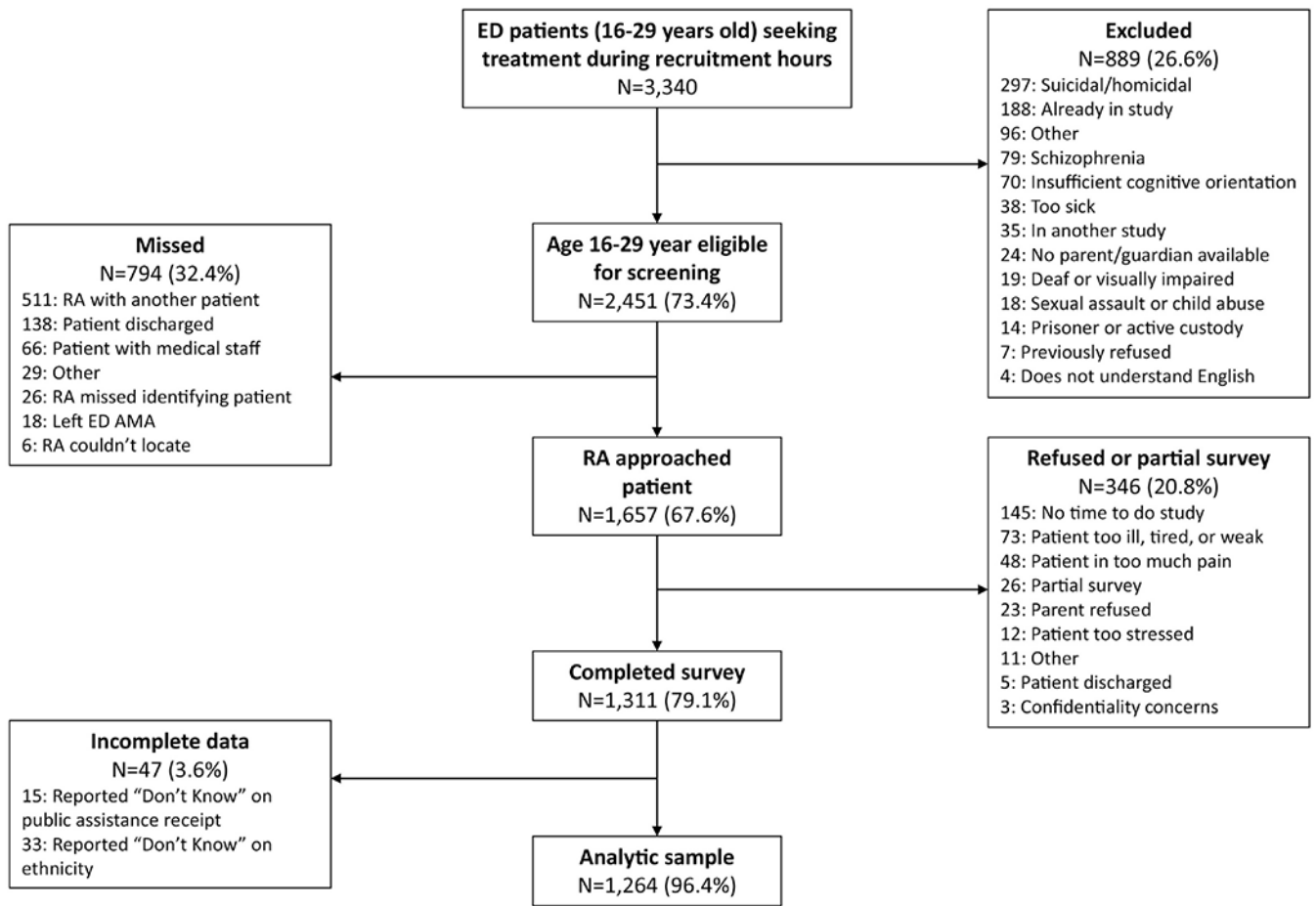


Figure 1.
Screening recruitment and analytic sample flowchart.

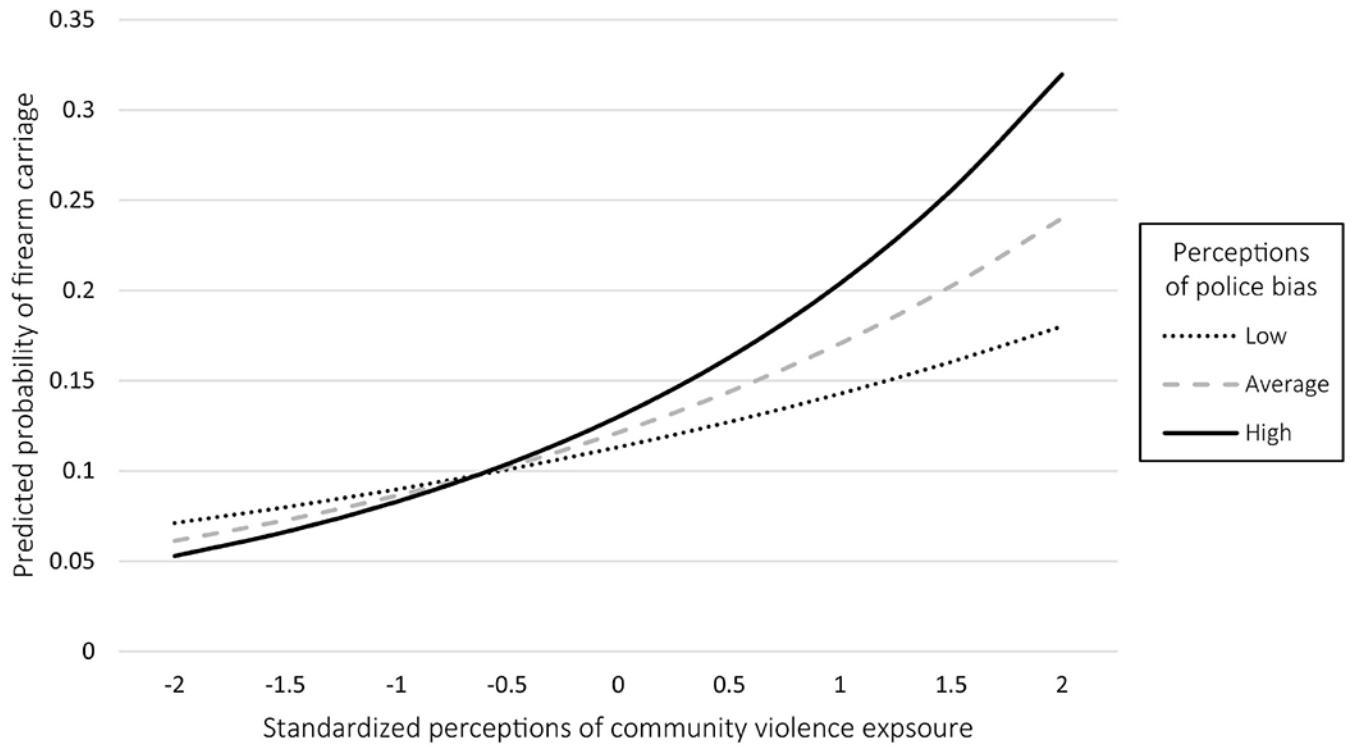


Figure 2.

Plot of predicted probability of firearm carriage against perceived community violence according to low, medium, and high levels of perceptions of police bias.

Note: Illustrated predicted probabilities are adjusted predicted probabilities of firearm carriage at representative values of perceptions of police bias and community violence exposure.

Table 1.

Descriptive statistics for the analytic sample (n=1,264).

Variable	<i>n</i>	%
Firearm carriage		
Carried in prior 3 months	177	14%
Did not carry in prior 3 months	1087	86%
Mean age, in years (SD)	22.3	(3.7)
Gender		
Man	372	29%
Woman	880	70%
Transgender/gender non-conforming/other	12	1%
Public assistance		
Receives public assistance	721	57%
Does not receive public assistance	543	43%
Race		
Black	647	51%
White	500	40%
Multi-racial/other	92	7%
American Indian or Alaska Native	14	1%
Middle Eastern	<10	<1%
Asian	<5	<1%
Native Hawaiian or other Pacific Islander	<5	<1%
Ethnicity		
Hispanic	83	7%
Non-Hispanic	1181	93%
Mean perceived community violence (SD)	8.7	(9.2)
Mean perceptions of police bias (SD)	13.5	(7.8)

Note. SD, standard deviation. Firearm carriage was defined as the respondent reporting having carried a firearm one or more times in the prior three months (as opposed to never carrying in the prior three months). We assessed perceived community violence exposure using summary scores from twelve items from the “Things I Have Seen and Heard” survey (range 0-36).³⁹ Perceptions of police reflected a summary score of seven items from the Perceptions of Police Scale⁴⁰ that assessed the degree to which individuals agreed with various statements regarding general attitudes toward police and perceptions of bias; higher scores reflected stronger perceptions of bias in law enforcement (range 0-28).

Adjusted relative risks, average marginal effects, and 95% confidence intervals from multivariable Poisson regression model of firearm carriage versus no firearm carriage for a sample of urban young adults (n=1,264)

Table 2.

Variable	Adjusted Relative Risk	Adjusted Average Marginal Effect (Difference in Predicted Probability)
Age	1.04 (0.99, 1.07)	0.00 (-0.00, 0.01)
Gender [ref.: <i>Woman</i>]		
Man	2.19 (1.67, 2.87) ***	0.12 (0.08, 0.17) ***
Transgender/gender non-conforming/other	0.81 (0.15, 4.22)	-0.03 (-0.21, 0.16)
Public assistance [ref.: <i>No assistance</i>]	0.92 (0.70, 1.20)	-0.01 (-0.05, 0.03)
Black [ref.: <i>non-Black</i>]	0.83 (0.64, 1.09)	-0.03 (-0.06, 0.01)
Hispanic [ref.: <i>non-Hispanic</i>]	0.92 (0.52, 1.64)	-0.01 (-0.09, 0.07)
Perceived community violence	1.41 (1.25, 1.58) ***	0.05 (0.03, 0.07) ***
Perceptions of police bias	1.07 (0.92, 1.24)	0.02 (-0.00, 0.04)
Perceived community violence*Perceptions of police	1.12 (1.01, 1.23) *	NA

Note:

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$.

N/A, Not Applicable. Perceptions of police bias and community violence are standardized. Results presented in this table are from a multivariable Poisson regression model which included an interaction term for perceptions of police bias and perceived community violence. Average Marginal Effect (AME) is the difference in average predicted probability of firearm carriage between the group of interest and the referent group (for categorical variables) or the difference in average predicted probability of firearm carriage associated with a one-unit increase in the variable of interest (for continuous variables), expressed as a proportion (e.g., an AME of + 0.05 indicates a 5-percentage point difference in predicted probabilities)