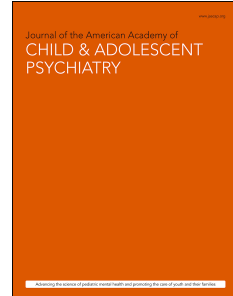


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Neighborhood Resource Deprivation as a Predictor of Bullying Perpetration and Resource-Driven Conduct Symptoms

RH = Effect of Deprivation on Perpetration

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DEI

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ABSTRACT

Objective: Resource deprivation is linked to systemic factors that disproportionately impact historically marginalized communities, and theoretical work suggests resource deprivation may increase risk for bullying behaviors. Bullying perpetration is an intransigent social problem and an early risk factor that perpetuates the school-to-prison pipeline. We explored how resource deprivation (family and neighborhood level metrics) was associated with early childhood bullying behaviors and clinician-rated symptoms of psychopathology, while accounting for other known risk factors (early life stressors, traumatic events, parental arrest, domestic violence).

Method: Participants (306 children, mean age=4.45 years) were enrolled in a longitudinal study (Preschool Depression Study) where demographics, clinician-rated assessments of psychopathology, and parent-reports of social functioning were collected. Measures of bullying behaviors (bullying perpetration, generalized aggression, and victimization) were constructed. A cross-sectional approach was employed and analyses examined the interrelations between race, bullying-related behaviors, resource deprivation, and psychopathology, while accounting for confounding variables, at the baseline assessment timepoint.

Results: Our bullying measure showed acceptable model fit (CFI=.956; TLI=.945 RMSEA=.061; SRMR=.052; normed χ^2 ratio=2). Neighborhood resource deprivation was more strongly associated with bullying perpetration ($r=.324$, $p<.001$), than generalized aggression ($r=.236$, Williams $t(303)=2.11$, $p=.036$), and remained significant when controlling for other known risk factors (parental arrests, domestic violence, stressors, traumas) and demographic factors. Bullying perpetration was linked with racial category, but the relationship was fully mediated by neighborhood resource deprivation. Linear regression including bullying behaviors and symptoms of clinical psychopathology suggest resource deprivation specifically led to increases in bullying perpetration ($t=2.831$, $p=.005$) and clinician-rated symptoms of conduct disorder ($t=2.827$, $p=.005$), which were attributable to increased rates of resource-driven conduct symptoms (bullies; lies to obtain goods; stolen without confrontation).

Conclusion: Resource deprivation is strongly and specifically associated with increases in bullying perpetration. Children growing up in impoverished neighborhoods show significant increases in resource-driven conduct behaviors, yet interventions often target individual level factors. Our results highlight the need to target social inequity to reduce bullying perpetration and suggest interventions targeting neighborhoods should be tested to reduce early youth bullying.

Diversity & Inclusion Statement: We worked to ensure sex and gender balance in the recruitment of human participants. We worked to ensure race, ethnic, and/or other types of diversity in the recruitment of human participants. We worked to ensure that the study questionnaires were prepared in an inclusive way. One or more of the authors of this paper self-identifies as a member of one or more historically underrepresented racial and/or ethnic groups in science. While citing references scientifically relevant for this work, we also actively worked to promote sex and gender balance in our reference list. We actively worked to promote inclusion of historically underrepresented racial and/or ethnic groups in science in our author group. One or more of the authors of this paper received support from a program designed to

increase minority representation in science. One or more of the authors of this paper self-identifies as a member of one or more historically underrepresented sexual and/or gender groups in science. One or more of the authors of this paper self-identifies as living with a disability. We actively worked to promote sex and gender balance in our author group. While citing references scientifically relevant for this work, we also actively worked to promote inclusion of historically underrepresented racial and/or ethnic groups in science in our reference list.

Key words: bullying perpetration; victimization; area deprivation index; neighborhood resource deprivation

INTRODUCTION

Bullying perpetration, defined as destructive interpersonal behavior that is targeted, repetitive, and intentional,¹ is a major global problem. Conservative estimates suggest at least 20% of school-aged children are victimized routinely,² which puts youth at greater risk of developing persistent problems across the lifespan, including marked increases in depression,³ anxiety,⁴ substance use,⁵ and suicidality.⁶ Bullying perpetration in youth is associated with persistent, antisocial behaviors across the lifespan.⁷ The cascading effects of bullying, for victims and perpetrators, take an exorbitant toll on individuals,⁸ schools,⁹ and society more broadly.¹⁰

Acts of bullying perpetration are understood as aggressive behaviors used to acquire social resources (e.g. status, friends, toys, etc.) at the expense of others.¹¹ Bullying perpetration is also a clinically-assessed symptom of Conduct Disorder (Conduct Disorder=CD),¹² which is frequently comorbid with related externalizing syndromes (Attention Deficit Hyperactivity Disorder (ADHD),¹³ Oppositional Defiant Disorder (ODD)).¹⁴ Those who bully others often engage in other aggressive behaviors, such as reactive fighting, and are often victimized themselves. As such, these “bullying-related behaviors” (e.g. bullying perpetration, generalized aggression, and victimization) are often measured simultaneously,¹⁵ and measures adopting such an approach show acceptable psychometric properties in Factor Analyses.^{16, 17}

Bullying-related behaviors in childhood are linked with parental criminal history,¹⁸ early life stressors and maltreatment;¹⁹ however, differential relations between bullying-related behaviors (bullying perpetration, generalized aggression, victimization) with other psychological variables have been observed. Research has found that early bullying perpetration is a strong predictor of

later criminality,²⁰ but that bullying perpetration is not strongly linked to either emotional distress⁸ nor deficits in social intelligence.²¹ While it has been noted that bullying research has largely focused on later childhood and adolescence,^{22, 23} research examining preschoolers has shown coercive behaviors can be “useful” for acquiring social resources²⁴⁻²⁶ and do not lead to reduced peer friendships.²⁷ This dissociation has led some to suggest that bullying perpetration may at least in part reflect an environmental adaptation,²⁸ enacted to ensure adequate resources in the face of an uncertainty or resource deprivation,²⁹ a strategy that has been observed across many species in the face of increased resource scarcity.³⁰ Importantly, if bullying perpetration is an adaptive strategy, interventions may have to shift to focus less on individual-level variables and more to structural factors that allow for bullying to have adaptive benefit. Furthermore, addressing preschool bullying has the potential to ameliorate the negative cascades that follow from cycles of perpetration and victimization, which is already prevalent in preschool aged children.^{8, 20, 31}

While bullying perpetration is postulated in some circumstances to be a strategy to gain resources, whether resource deprivation specifically leads to increases in bullying perpetration is not well-established. Resource deprivation has been shown to be strongly deleterious to psychosocial functioning broadly³² - with negative impacts observed in executive functions, neurodevelopment, and psychopathology writ large^{33, 34} – but prior work is inconclusive on how strong of a differential effect resource deprivation plays in rates of bullying perpetration, generalized aggression, and victimization.³⁵ Furthermore, structural and systemic factors in the US have concentrated health disparities in racially and ethnically minoritized communities.^{36, 37} Reported rates of bullying perpetration and victimization are disproportionately higher in racially

minoritized groups,³⁸ suggesting disparities in bullying-related behaviors may reflect health disparities attributable to resource deprivation.

Understanding how resource deprivation impacts preschool-aged bullying in relation to other causal factors, and whether clinician-based assessments and parent reports of bullying perpetration provide convergent evidence are important questions that can provide guidance to policy makers and researchers tasked with reducing the costs associated with early aggression. To address these questions, we employed a cross-sectional approach focusing on the baseline visit of a larger longitudinal investigation of psychosocial development. Our analysis leveraged both parent and clinician reports from a longitudinal data-set (the Preschool Depression Study: PDS)³⁹ which followed children (n=306) from preschool to late adolescence to test the following hypotheses: **i**) in preschool, resource deprivation is more strongly related to bullying perpetration compared to generalized aggression, even when accounting for co-occurring risk factors, **ii**) relations between race and bullying-related behaviors can be accounted for by resource deprivation, **iii**) the relationships between resource deprivation and parent-reported bullying-related behaviors remain significantly associated with one another, even when accounting for clinician-based assessments of psychopathology, and **iv**) clinician-assessed externalizing symptoms would provide convergent evidence with associations between parent-reported bullying perpetration and resource deprivation.

METHOD

Participants

Study participants were drawn from the baseline visit of the PDS, a longitudinal investigation of children recruited primarily from an urban, metropolitan city in the Midwest who were enriched for early symptoms of internalizing and externalizing clinical psychopathology.^{39,40} Participants were recruited from primary care and mental health settings, based on advertisements assessing “emotional development” (see Supplement 1, available online, for more details of Sample Ascertainment and Reliability). At the baseline visit (T1), participants ranged in age between 3-6 years (N= 306). While not the focus of this article, participants were assessed on a regular basis throughout adolescence (through ages 16-19 years), including almost yearly structured interviews and behavioral questionnaires. Parents reported on participants biological sex (categorical: male/female) and other demographic information described below.

Measures

Race. Racial category for participants was reported by parents (see Table 1). Parents reported participant’s race as either American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Pacific Islander, White, or more than one race. Ethnicity (Hispanic or Latino/not Hispanic or Latino) was not reliably collected in the sample and has been excluded from analyses.

Bullying-Related Behaviors. To assess the presence of different bullying-related behaviors at the baseline assessment, the first author (MTP) created a 13 item composite measure from the Parent Report of the Health and Behavior Questionnaire (Version 1.0),⁴¹ that delineated bullying perpetration, generalized aggression, and victimization and was designed to conceptually match a validated tripartite model of different bullying-related behaviors (the Illinois Bully Scale).⁴²

The bullying perpetration factor consisted of 4 items (when mad at peer, excludes that peer; taunts and teases peers; gets back at people; is cruel, bullies, is mean to others) and each item was rated on a 0-2 scale; the generalized aggression factor consisted of 5 items (temper tantrums or hot tempered; physically attacks people; kicks, bites, or hits other children, gets in many fights; is irritable) and each item was rated on a 0-2 scale; and the victimization factor consisted of 4 items (is actively picked on; is actively disliked and rejected; is teased and ridiculed; is pushed or shoved by other kids) and each item was rated on a 1-4 scale (see Supplement 1, available online, for Composite Measure Creation and Table S1, available online). Items within each scale were averaged to create continuous factor scores.

Resource Deprivation. Two different continuous measures of resource deprivation were utilized from the baseline assessment in the analysis, to determine if family level versus broader neighborhood level measures were more strongly associated with bullying-related behaviors. The Income to Needs⁴³ measure assesses the resources of a family, in proportion to the federal poverty line, and was calculated using parent-reported total family income and total number of people living in the household, with higher scores indicating greater levels of income to the needs of the family. The Area Deprivation Index (ADI)⁴⁴ is a composite measure which uses 17 Census-based poverty, education, housing quality, and employment indicators to characterize and rank the relative disadvantage of different neighborhoods across the United States. The ADI is calculated using the participants' home address and is scored on a national percentile level (1-100), with higher scores indicating greater resource scarcity.

Psychopathology and Life Events: In the PDS, children and parents participated in semi-structured clinical diagnostic and developmental interviews annually with a trained clinical interviewer with good interrater reliability (see Supplement 1, available online, for details on Reliability). Specifically, using the Preschool Age Psychiatric Assessment (PAPA),⁴⁵ the total number of symptoms of major depressive disorder (MDD), generalized anxiety disorder (GAD), attention deficit hyperactivity disorder (ADHD), oppositional defiant disorder (ODD) and conduct disorder (CD) were assessed using DSM-IV-TR criteria.⁴⁶ Stressful (e.g. parental separation), traumatic life events (e.g. death of a parent), domestic violence, and parental arrest were parent-reported using the PAPA.

Initial Analysis plan

To determine the dissociability of bullying-related behaviors, we performed confirmatory factor analyses (CFA), to parse bullying-related behaviors into a three-factor solution of bullying perpetration, generalized aggression, and victimization.⁴² We also attempted a two-factor solution (aggression, victimization) and a one-factor solution (all bullying-related behaviors) to reflect other bullying measures.¹⁵ Model fit was assessed across an array of absolute and relative fit indices.⁴⁷ After exploring model fit, we employed multiple imputation via linear regression for all concurrent variables (bullying-related behaviors, age, sex, race, income to needs, ADI, concurrent life events and psychopathology) to reduce the potential for biased estimates driven by any missing values (see Supplement 1, available online, for details on Imputation and Table S2, available online).⁴⁸

To examine interrelations between racial category, resource deprivation, and bullying-related behaviors, we completed a series of analyses. One-way Analysis of Variance tests (ANOVAs) examined the relationship of racial category to resource deprivation and bullying-related behaviors. Bonferroni-comparison corrected independent samples t-tests were run to assess comparative differences. Zero-order correlation analyses were run with bullying-related behaviors and metrics of resource deprivation (income to needs, ADI). To assess for specificity, follow-up analyses included Williams' tests comparing the strength of relationships of the different bullying-related behaviors to resource deprivation, assuming shared covariance structures.⁴⁹ One-way ANOVAs were used to determine the relationship between racial categories (White, Black or Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, more than one race) and bullying-related behaviors, with follow-up Bonferroni-comparison corrected independent samples t-tests used to determine comparison effects.

In the event of significant associations, mediation analyses examining how resource deprivation mediates relations between racial category and bullying-related behaviors were proposed (see Supplement 1, available online). Specifically, mediation analyses exploring if resource deprivation (neighborhood or individual) (M) fully or partially mediated the link between race (X) and associated bullying-related behaviors (Y: bullying perpetration, generalized aggression, victimization), while controlling for demographic factors. To provide further tests of robustness, we conducted i) a linear regression model including all bullying-related behaviors in relation to resource deprivation, and ii) an additional linear regression model including all bullying-related behaviors and additional covariates (presence of stressful events, presence of traumatic events, parental arrest record, presence of domestic violence, demographic factors) to include all

variables which might impact relationships between resource deprivation and bullying-related behaviors.

To determine if relations between parent-reported bullying-related behaviors and resource deprivation were robust when accounting for clinical symptoms of psychopathology, we performed zero order correlations between bullying-related behaviors, symptom counts of psychopathological conditions (MDD, GAD, ADHD, ODD, CD), and resource deprivation. To assess for specificity, follow-up analyses included a) Williams' tests comparing the relative strength of relationships of the three different bullying-related behaviors to psychopathology, and b) a linear regression model including measures of bullying-related behaviors, our measures of internalizing (MDD, GAD) and externalizing (ADHD, ODD, CD) symptoms, and demographic variables in relation to resource deprivation.

CFA analyses were run using the Lavaan package⁵⁰ in R. Mediation analyses were run using the PROCESS V4.⁵¹ All other analyses were conducted using SPSS Version 28 (IBM Corp., Armonk, NY). Bonferroni corrections were applied for multiple comparisons where applicable.

RESULTS

Dissociability of Bullying-Related Behaviors

Confirmatory Factor Analyses showed that the three factor solution (Bullying Perpetration, General Aggression, Victimization, see *Figure 1*) demonstrated acceptable model fit to the data ($\chi^2 = 124.315$ (62), normed χ^2 ratio=2; RMSEA = .06; SRMR = .05; CFI = .96; TLI = .95 – see *Figure S1*, available online). All items exhibited strong loadings (see *Table S3*, available online)

onto their respective latent factors and the alpha reliability of each factor was adequately high (victimization $\alpha = .80$; general aggression $\alpha = .81$; bullying perpetration $\alpha = .78$ – see Table S4, available online). Goodness of fit statistics for both the two factor (aggression and victimization) and one factor (all bullying-related behaviors) suggest less than adequate model fit, convergent with past research findings⁴² (see Table S5, available online).

Differential Relationships of Resource Deprivation, Race, and Bullying-Related Behaviors

The large majority of the sample identified solely as White (53.92%) or Black (32.68%), whereas a smaller subset identified as either Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, or more than one race (13.40%). Both family (One-way ANOVA $F(2,303)=88.338, p<.001$) and neighborhood ($F(2,303)=96.884, p<.001$) measures of resource deprivation were significantly related to race, with White participants having greater resources (income to needs mean=2.655, SD=.84; ADI mean=35.61, SD=22.08) than Black participants (income to needs mean=1.019, SD=.84, $t(246)=14.812, p<.001$; ADI mean=78.02, SD=20.37, $t(246)=15.030, p<.001$) and Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, or more than one race participants (income to needs mean=2.087, SD=1.19, $t(46.210)=2.775, p=.008$; ADI mean=46.66, SD=28.72, $t(48.191)=2.217, p=.031$). Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, or more than one race participants also had greater resources than Black participants (income to needs: $t(53.131)=5.019, p<.001$; ADI: $t(53.047)=6.126, p=.001$). All findings survive Bonferroni multiple comparison correction except the comparison of ADI between White and Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, or more than one race participants.

Bullying-related behaviors were significantly correlated to measures of resource deprivation. Income to needs had similar relations to all bullying-related behaviors (see Table 2). However, there was variation in effect sizes between ADI and bullying-related behaviors; specifically, the relationship between ADI and bullying perpetration was significantly stronger than the relationship between ADI and generalized aggression (Williams $t(303)=2.11, p=.036$). Further, the association between ADI and bullying perpetration was significantly stronger than the relationship between Income to Needs and bullying perpetration (Williams $t(303)=2.64, p=.008$).

Given that the neighborhood-level measure of resource deprivation had differential relations to bullying perpetration whereas the family-level measure did not, we limited future analyses to ADI. Both bullying perpetration (One-way ANOVA $F(2,303)=6.795, p=.001$) and victimization ($F(2,303)=4.752, p=.009$) were differentially associated with racial identification. Black participants had more experiences with bullying perpetration (Mean=0.61, SD=.51) than White participants (Mean=0.42, SD=.44, $t(169.095)=2.860, p=.005$). Additionally, Black participants experienced more Victimization (Mean=1.62, SD=.62) than White participants (mean 1.40, SD=.53, $t(246)=2.973, p=.003$). Neither group significantly differed from the Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, or more than one race participants in bullying perpetration (mean=.60, SD=.45) or victimization (mean=1.50, SD=.47) after applying Bonferroni corrections. Rates of generalized aggression did not significantly differ between racial categories.

We ran mediations to explore how ADI impacted the links between racial category and both bullying perpetration and victimization. In the bullying perpetration mediation (Figure 2A), we observed a significant relationship between race and ADI and a significant relationship between ADI and bullying perpetration. The total direct effect between race and bullying perpetration is significant; however, the indirect effect once accounting for ADI became non-significant, suggesting ADI fully mediated the relationship between racial identification and bullying perpetration. In the victimization mediation (Figure 2B), the race to ADI effect was the same as the prior model, and the relationship between ADI and victimization was also significant. The total direct effect between racial identification and victimization is significant; however, the indirect path once accounting for ADI again becomes non-significant, suggesting ADI fully mediated the relationship between race and victimization.

In our proposed linear regression exploring the relationship between bullying perpetration and ADI considering all covariates, we observed that relations between ADI and bullying remained statistically significant. The only significant predictors of bullying perpetration in this comprehensive model were concurrent generalized aggression and ADI (see Table 3A and Table S6, available online).

Relationships at Age 4 Between Bullying-Related Behaviors, Psychopathology, and Resource Deprivation

Both bullying perpetration and generalized aggression at age 4 were significantly associated with concurrent symptoms of MDD, ADHD, ODD, and CD ($r > .25$, $p < .001$). Victimization was associated with MDD and ADHD ($r > .25$, $p < .001$) (see Table S7, available online). Bullying

perpetration was more significantly associated with symptoms of ODD ($t(303)=3.4, p<.001$) and CD ($t(303)=4.87, p<.001$) compared to the relationship of victimization behaviors with these symptoms. Generalized aggression was more significantly associated with symptoms of ADHD ($t(303)=3.5, p<.001$), ODD ($t(303)=6.39, p<.001$), and CD ($t(303)=6.00, p<.001$) compared to the relationship of victimization behaviors with these symptoms. Generalized aggression was more significantly associated with symptoms of ODD ($t(303)=3.77, p<.001$) than the relationship of bullying perpetration with these symptoms (see Table S8, available online).

We found that both measures of resource deprivation were significantly associated with ADHD symptoms, CD symptoms, and depression symptoms: in all instances, as resource deprivation increased, the number of these symptoms also increased (see Table S9, available online). A linear regression including all symptoms found that only ODD and CD symptoms were significantly related to ADI (see Table S10, available online). In a follow-up linear regression with measures of demography, psychopathology and bullying-related behaviors, we found that CD symptoms, ODD symptoms, bullying perpetration, and racial category were significantly related to the ADI. As neighborhood resource deprivation increased, bullying perpetration and symptoms of Conduct Disorder increased (see Table 3B and Table S10, available online).

In a post-hoc analysis, we tested whether the relationship of CD symptoms to ADI was specific to particular symptoms by running a series of independent samples t-tests. We found that only three CD symptoms were significantly related to resource scarcity, including 1) bullies, threatens or intimidates others ($p=.003$); 2) lies to obtain goods/favors ($p<.001$); and 3) stolen from others without confrontation ($p<.001$; see Table S11, available online).

DISCUSSION

The current study found that preschool-aged bullying perpetration is robustly and specifically related to neighborhood resource deprivation. Experiencing victimization is also strongly associated with resource deprivation. Our analyses demonstrate that living in a resource deprived neighborhood is linked with increases in both bullying perpetration and victimization.

Importantly, resource deprivation fully mediated any relationship between race and bully experiences. The relation between resource deprivation and bullying perpetration persists even when accounting for other co-occurring bullying-related behaviors, life stressors and trauma, household domestic violence, parental arrests and demographics. Notably, neighborhood resource deprivation was more predictive of early bullying perpetration than family-level measures of resource deprivation, suggesting that a paucity of resources in the broader environment is more influential to this social behavior than the home environment alone. Prior work has shown that poverty is associated with bullying perpetration⁵² and emotional dysregulation;⁵³ our work highlights that the link between neighborhood resource deprivation and bullying perpetration may be specific, as other aggressive youth behaviors, such as fighting and irritability, are not as strongly linked to neighborhood resource deprivation. Convergent findings from parent-report and clinician-based assessments of bullying behavior provide clear evidence that neighborhood resource deprivation is strongly and uniquely linked to higher early bullying perpetration and resource-driven conduct symptoms. Our findings point to neighborhood resources as a specific and tractable target for enhanced focus of bullying perpetration prevention efforts.

While past work has largely found non-specific but powerful negative effects of resource deprivation on psychosocial functioning, our results suggest early exposure to neighborhood resource scarcity may specifically increase bullying perpetration and resource-driven conduct symptoms. Consistent with the theory that bullying perpetration serves a functional goal of attaining needed or desired resources,^{1, 54} we find that parent-reported bullying perpetration was significantly and robustly related to early neighborhood resource deprivation. We speculate that early bullying perpetration may be a behavioral response to exposure to neighborhood resource deprivation and believe this is a novel and under-recognized driver of risk. Being in these environments also may place individuals at greater risk for victimization, which likely reinforces the view that the environment is hostile and unpredictable.

These results highlight the need to urgently remedy policies and systems which maintain wealth inequality, as neighborhood resource deprivation may play a role in the emergence of these adverse social health behaviors, and their disproportionate impact on marginalized communities.⁵⁵ Neighborhood resource deprivation, compared to family-level resource deprivation, is more strongly associated with early youth bullying perpetration. This is consistent with the important role of the external social environment on peer-based social behaviors in childhood. There has been significant interest recently in understanding the impacts increased resources may play in improving mental health outcomes. Interventions focused on mesosystems,⁵⁶ such as school re-financing, have been shown to have broad, positive effects on psychosocial functioning, economic output,^{57, 58} and specifically on reducing bullying perpetration.⁵⁹ Preliminary evidence examining the effect of direct cash payments to families suggests these types of interventions may be less impactful on psychosocial functioning,⁶⁰

though this research is in a nascent stage and in need of further scholarship before direct comparisons can be drawn.

Our results align with arguments aimed at targeting meso-level systems in efforts to reduce bullying, specifically neighborhood level resources.⁶¹ Neighborhood rejuvenation projects have been shown to be broadly successful at improving mental health outcomes,⁶² though have not specifically examined bullying perpetration. Perhaps positive changes in community mental health from neighborhood rejuvenation may stem from reductions in bullying perpetration, though this is largely suppositional at this stage. Targeting schools and neighborhood resources, perhaps via changes to taxation⁶³ may prove integral for reducing the exorbitant social and public health cost of bullying perpetration, as well as the other established problems associated with resource deprivation.⁵³

The current study should be considered in light of its limitations. This is an observational study starting at age four which relied upon a clinically enriched sample and does not address effects of resource deprivation on earlier behavior. While the data collection for this study is rich, future work will need to replicate the specificity of these effects and rule out confounding explanations. Our use of a composite measure of bullying-related behaviors necessitates replication attempts with validated bullying measures. Furthermore, our sample has incomplete ethnicity data at the earliest timepoint, and a limited number of non-Black and non-White participants. Other studies suggest ethnicity is linked with bullying behaviors, suggesting that the link between ethnicity and resource deprivation as it relates to bullying perpetration is also worth exploring. Furthermore, follow-up analyses could explore the impact of other related variables (e.g. parenting) not

explored here. Future examinations can explore earlier neurobehavioral effects, while focusing on adding more sources of information (i.e. self, peer, and teacher report) which may provide divergent information.⁶⁴ The current study does not address how resource deprivation may produce bullying perpetration, so future work is needed to explicate the individual level mechanisms that are affected⁶⁵ that may lead to individual level increases in bullying perpetration.⁶⁶ Recent work shows parental resource deprivation impacts the child's social network development,⁶⁷ as well as brain development and circuit functioning.⁶⁸ Exploring the pathway from resource deprivation exposure to bullying perpetration may elucidate individual-level targets for intervention programming.

Reducing early bullying perpetration through identifiable targets at all levels (e.g. individual, family, school, neighborhood) has the potential to have cascading, positive, anti-racist effects. Early presentations of aggression are associated with persistently worse adult outcomes,⁶⁹ highlighting the need to address bullying perpetration as early in development as possible when behavior is more malleable. Our results show that preschool-aged bullying perpetration and victimization are associated with exposure to neighborhood resource deprivation, adverse social health behaviors as early as the preschool period which disproportionately impact Black children. Examining how changes to neighborhood level factors impact early bullying is an important and necessary next step to begin to meaningfully address health disparities associated with youth violence.

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Table 1. Descriptive Statistics Of Demographics, Parent-Reported Life Events, and Psychopathology

Demographic characteristics (N=306)	N	Mean	SD	Range
<i>Sex</i>				
Female	148			
Male	158			
<i>Race</i>				
Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, more than one race	41			
Black	100			
White	165			
<i>Age (years)</i>		4.45	0.80	3.01-6.00
<i>Resource Deprivation</i>				
Area Deprivation Index		51.11	29.31	2-99
Income to Needs		2.03	1.17	0-3.93
Presence of Life Events	N	Mean	SD	Range
Stressful Event	296			
Traumatic Event	231			
Parental Arrest	27			
Domestic Violence	30			
Number of Psychopathology Symptoms	N	Mean	SD	Range
Depression		2.52	1.78	0-8
Generalized Anxiety		0.79	1.42	0-6
Attention Deficit Hyperactivity Disorder		4.25	4.46	0-17
Oppositional Defiant Disorder		2.16	2.10	0-8
Conduct Disorder		1.06	1.45	0-9

Table 2. Zero Order Correlation Matrix of Parent-Reported Bullying-Related Behaviors and Measures of Resource Scarcity

Variable	Mean	SD	Range	1	2	3	4
1.Bullying Perpetration	0.52	0.49	0-2.0	---			
2.Generalized Aggression	0.61	0.48	0-2.0	.71***	---		
3.Victimization Behaviors	1.51	0.61	1-4.0	.30***	.37***	---	
4.Income to Needs	2.03	1.17	0-3.93	-.21***	-.17**	-.21***	---
5. Area Deprivation Index	51.11	29.31	2-99	.32***	.24***	.20**	-.66***

* $p < .05$; ** $p < .01$; *** $p < .001$

Table 3. Linear Regressions of Bullying-Related Behaviors With Risk Factors and Psychopathology

A) Associations with Bullying Perpetration	Unstandardized Beta	SE	Standardized Beta	<i>t</i>	Significance
Generalized Aggression	.672	.050	.660	13.491	>.001
ADI	.002	.001	.144	3.132	.002
Victimization	.012	.035	.015	.337	.736
Stressful Events	-.105	.118	-.038	-.885	.377
Traumatic Events	.005	.048	.004	.107	.915
Parental Arrests	.032	.078	.019	.417	.677
Domestic Violence	.028	.077	.017	.359	.720
Sex	.023	.040	.024	.587	.557
Age	.039	.025	.064	1.524	.128
Race	.025	.035	.036	.704	.485
B) Associations with ADI	Unstandardized Beta	SE	Standardized Beta	<i>t</i>	Significance
MDD Symptoms	-.485	1.119	-.030	-.433	.665
GAD Symptoms	-.302	1.223	-.015	-.247	.805
ADHD Symptoms	.300	0.503	.045	.596	.552
ODD Symptoms	-2.012	0.988	-.144	-2.036	.042
CD Symptoms	4.124	1.459	.204	2.827	.005
Bullying Perpetration	12.914	4.561	.214	2.831	.005
Generalized Aggression	-0.430	5.066	-.007	-.085	.932
Victimization Behaviors	5.482	2.955	.115	1.855	.065
Sex	5.134	3.138	.088	1.636	.102
Age	-2.305	1.953	-.063	-1.180	.238
Race	11.997	2.212	.293	5.424	>.001

Note: Boldface type indicates significant associations ($p < .05$). A) Shows the linear regression results of theoretically related predictors of parent-reported bullying perpetration scores at age 4. Only generalized aggression and neighborhood resource deprivation significantly predicted preschool aged bullying perpetration. B) Shows the linear regression results showing the relationship of area deprivation index (ADI) with both symptom counts of psychopathology and bullying-related behaviors (bullying perpetration, generalized aggression, victimization). Both bullying perpetration and clinician assessed symptoms of conduct disorder were significantly associated with ADI. ADHD = attention-deficit/hyperactivity disorder; CD = conduct disorder; GAD = generalized anxiety disorder; MDD = major depressive disorder; ODD = oppositional defiant disorder.

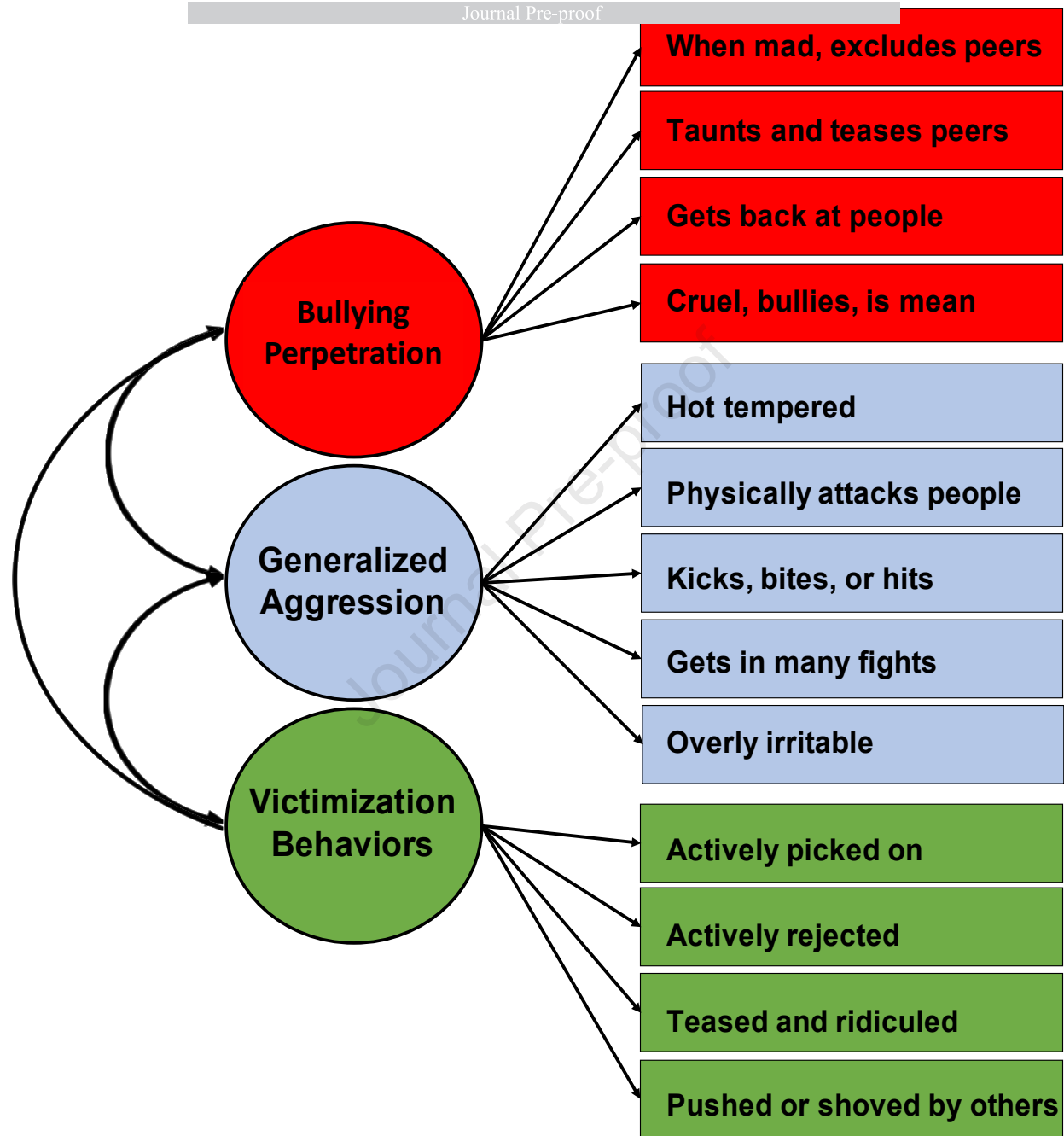
Figure 1. Proposed Model of Bullying-Related Behaviors

Note: We created a composite measure of bullying behaviors derived from the Illinois Bully Scale,⁴² using questions from the MacArthur Health and Behavior Questionnaire.⁷⁰ Using confirmatory factor analysis, we binned items into three correlated factors of bullying perpetration (red), which included goal-directed aggression items aimed at social dominance; generalized aggression (blue), which included reactive aggression items; and victimization (green), which included items about being the target of aggression.

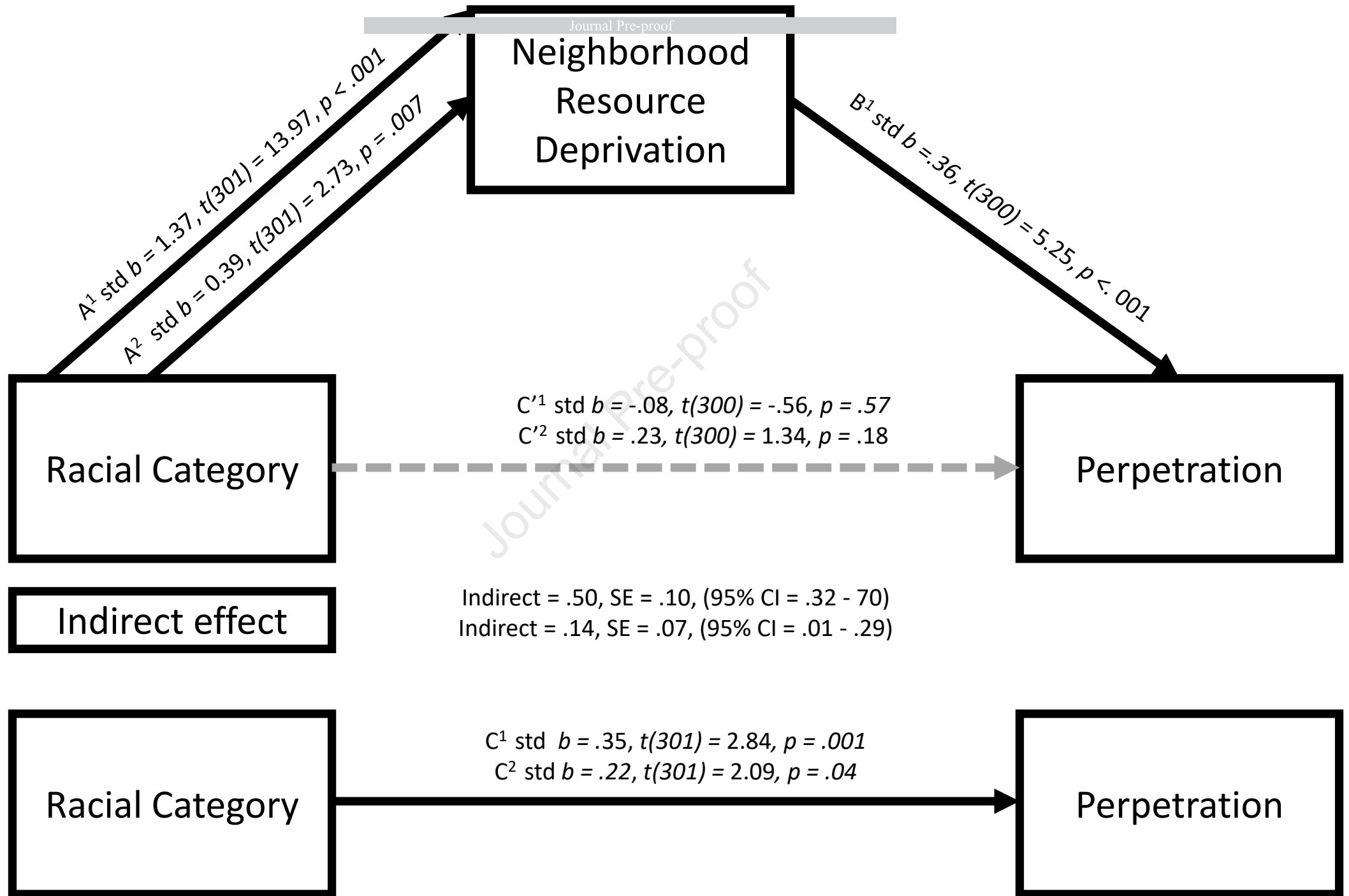
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Figure 2. Neighborhood Resource Deprivation Mediation Models

Note: Mediation analyses explored whether exposure to neighborhood resource deprivation (Area Deprivation Index) explained the relationship between racial category and parent-reported preschool bullying-related behaviors, while controlling for sex and age. We observed that neighborhood resource deprivation fully mediated both the relationships of race with bullying perpetration (**A**) and victimization (**B**).



A



B

