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Does state-level supplemental nutrition assistance program access reduce firearm mortality among black youth? A two-way fixed effects analysis of age-stratified and cause-specific outcomes across 22 states, 2000–2020

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Abstract

Background Firearm-related injuries represent a growing public health crisis disproportionately affecting Black youth in the United States. While research has established strong associations between poverty and community violence, the potential for poverty-alleviation policies to reduce firearm mortality remains understudied. This study examines the relationship between state-level Supplemental Nutrition Assistance Program (SNAP) access for Black individuals and firearm mortality rates among Black youth aged 10–34, analyzing variations by cause of death and age group.

Methods Using a two-way fixed effects design, we analyzed state-level data from 2000 to 2022, examining how SNAP access affected firearm mortality rates. SNAP access was calculated as the ratio of Black SNAP households to eligible Black households below 125% of the federal poverty line. Outcomes included firearm-related deaths (homicide, suicide, accidental, undetermined) among Black youth aged 10–34, identified through National Vital Statistics System data. We used generalized linear models with Poisson distribution, adjusting for state and year-fixed effects, demographic characteristics, and policy covariates.

Results SNAP access for Black individuals showed the strongest protective association with firearm homicides among youth aged 10–18 (adjusted RR = 0.93; 95% CI: 0.89–0.97). Increased SNAP access among this age group was also associated with significant reductions in total firearm mortality adjusted for state and year fixed effects (RR = 0.93; 95% CI: 0.88–0.98), and further adjustment resulted in similar estimates. Firearm suicide estimates suggest a potential protective association, particularly for youth aged 19–25 (adjusted RR = 0.90; 95% CI: 0.85–0.96). No associations were found with accidental firearm deaths across age groups.

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Conclusion State-level SNAP access for Black individuals demonstrates protective associations with firearm mortality among Black youth, particularly for homicides affecting adolescents aged 10–18 years and suicides for young adults aged 19–25. These findings suggest that expanding receipt of SNAP benefits among families living near or below the federal poverty line could serve as an upstream intervention for reducing firearm violence, especially during critical developmental periods. Future research examining mechanisms linking economic support to violence prevention is warranted to explore integration with other protective interventions.

Keywords Injury and violence prevention, Economic policy, Health disparities, Black youth, Food security

Introduction

Firearm-related injuries represent an urgent pediatric public health crisis in the United States, with particularly devastating impacts on Black youth [1, 2]. Firearm injuries are the leading cause of death for youth (ages 10–24), with 63% of these deaths resulting from homicides [3]. Teens (ages 14–17) are more likely to die from a firearm injury than any other cause. During the coronavirus pandemic, firearm-related homicides surged by 45% from 2019 to 2021, while firearm-related suicides rose by 10% [4]. Overall, firearm-related deaths among youth increased by 50% in just two years, from 1,732 in 2019 to 2,590 in 2021. Recent data indicate that non-Hispanic Black youth experience firearm-related mortality rates 17 times higher than their White counterparts, underscoring the urgent need for effective interventions [3]. This stark increase and racial disparity highlight the intersection of structural racism, adolescent development, and community safety [5, 6].

Research has consistently demonstrated a strong association between poverty and community violence, particularly in urban areas with high concentrations of Black youth [7, 8]. This relationship operates through multiple pathways, including reduced access to resources, increased exposure to environmental stressors, and limited opportunities for positive youth development [8–10]. However, the complex relationship between poverty-alleviation policies and firearm-related mortality rates among this vulnerable population remains understudied. Evaluating the potential for such policies to minimize firearm-related mortality may open up new avenues for reducing violence and improving safety at the population- and community- levels.

The Supplemental Nutrition Assistance Program (SNAP) represents a promising avenue for investigation, providing food benefits to approximately 42 million low-income Americans [11–13]. As a cornerstone of federal assistance with half its recipients under age 18, SNAP's impact extends beyond food security to broader social determinants of health. Studies have shown that SNAP participation is associated with improved child health outcomes, reduced household financial stress, and enhanced family stability [11, 14]. However, its potential role in reducing firearm violence, particularly among Black youth, has not been thoroughly examined.

Understanding this relationship is crucial given both SNAP's extensive reach and the stark racial inequities in poverty exposure. Black families are 12 times more likely to live in concentrated poverty than White families, and multi-generational poverty is more than 16 times higher among Black adults than White adults [14]. Recent evidence suggests that economic support programs may be especially effective at reducing injury and violence when they address basic needs like food security [14]. This investigation is particularly timely given growing recognition of how structural racism has historically perpetuated health disparities, leading to increased calls for upstream interventions to address youth violence [14]. Indeed, structural racism creates a cascade of challenges for Black youth, who are disproportionately exposed to poverty, reduced healthcare access, and increased community violence [8]. As both a function and consequence of structural racism, these interconnected material hardships represent upstream factors that traditional violence prevention approaches—such as child access prevention laws and mass media awareness campaigns—often fail to adequately address. By considering SNAP as a structural intervention, this study responds to calls to target the fundamental causes of racial disparities in youth firearm violence [15].

This study investigates the relationship between state-level SNAP access and firearm-related mortality among Black youth, leveraging variation in policy and program implementation across states. Our analysis addresses key methodological challenges, including race classification discrepancies in death certificates, while examining how differences in SNAP policies influence mortality outcomes. By exploring the intersection of social policy and firearm violence, this research aims to inform evidence-based interventions that advance health equity and community safety.

Methods

Descriptive statistics were calculated to examine the distribution of key variables within the dataset. To examine the impact of state-specific SNAP access on firearm violence among Black youth (10–34 years old), we utilized two-way fixed effects methods. While SNAP is a federal policy, states have significant freedom in their administration. To capture this variation, we estimate a

state-specific SNAP to poverty ratio to proxy for these underlying state policy and administrative changes [16–19], and which represents an ongoing, long-term natural experiment. However, the impact of state-specific policies is not equitably distributed by race [20]. To account for this, we estimate a novel measure of the SNAP-to-poverty ratio estimated specific to Black families. By estimating race-specific measures of SNAP access, we are able to examine the association between state SNAP policy on deaths caused by firearms for Black youth accounting for the inequitable distribution of program resources. The sample period spans from 2000 to 2020.

Measures

Exposure

State-level SNAP access for Black individuals was created by adapting the SNAP Program Access Index (SNAP PAI) defined by the U.S. Department of Agriculture, wherein SNAP PAI is calculated as the state-specific annual count of SNAP participants divided by the number of people in the state below 125% of the federal poverty line [21]. Using one-year estimates from The Census Bureau's American Community Survey (ACS) Public Use Microdata Sample (PUMS) from 2000 to 2022 [22] we calculated SNAP access for Black individuals as the weighted number of Black [Black or African American alone or in combination with another race or more than one race] householders or reference persons not living in group quarters who received SNAP benefits divided by the weighted number of Black householders or reference persons not living in group quarters below 125% of the federal poverty line by state and year. As ACS data are complex survey data and are subject to uncertainty, we calculated the coefficient of variation (CV) for annual, state-specific estimates of SNAP access to assess reliability. A CV of less than 12%, between 12% and 40%, and greater than 40% indicates an estimate of high, moderate, and low reliability, respectively [23, 24]. Only states with SNAP access estimates that had moderate to high reliability for all years were included for analysis, as no state had a SNAP access measure with high reliability for all years of our study period. As a result, 22 states were included for analysis.

Firearm outcomes

While the Centers for Disease Control and Prevention's (CDC) Wide-ranging ONline Data for Epidemiologic Research (WONDER) provides firearm mortality rates, CDC WONDER data are subject to suppression rules, so we obtained mortality outcomes from 2000 to 2020 from the National Vital Statistics System (NVSS), which provides 100% census mortality data [25]. To create frequencies, deaths related to firearms were defined as having the following *International Classification of*

Disease— 10th Revision (ICD-10) codes listed as the cause of death: W32-W34 (accidental discharge of firearm), X72-X74 (intentional self-harm by firearm), X93-X95 (assault by firearm), or Y22-Y24 (firearm discharge, undetermined intent). Additionally, we restricted death certificate records to youth aged 10–34 and identified as Black. Bridged race from NVSS was used to identify Black individuals; after 2020, bridged race was unavailable due to changes in death certificate reporting [26]. As a result, data were restricted to the years 2000 to 2020 to allow for sufficient variation in our SNAP access index by state over time while using a consistent definition of race. In addition to firearms deaths across 10–34 year olds, we calculated rates for 10–18 year olds, 19–25 year olds, and 26–34 year olds as economic policies may have distinct effects across developmental periods [27].

Covariates

National Welfare Data from the University of Kentucky Center for Poverty Research (UKCPR) [28] were used for annual, state-specific covariates including: unemployment rate measured as a percentage of the labor force; gross domestic product (in millions); poverty rate (percent); maximum monthly Aid to Families with Dependent Children (AFDC)/Temporary Assistance for Needy Families (TANF) benefit for a 3-person family; and state minimum wage. Additionally, we utilized the Traveler's Guide to the Firearms Laws of the Fifty States, an annual report which includes a permissiveness scale for each state's firearm laws [29], which can be used as a reliable proxy for state firearm policy and ownership [30]. The annual, state percentages of Hispanic householders and Black householders were both obtained from ACS PUMS one-year estimates [22]. To estimate firearm death rates, ACS PUMS one-year estimates were also utilized for the annual, state population estimates of Black youth, which included individuals regardless of housing type (i.e., included those living in group quarters) [22].

Statistical analysis

To evaluate the impact of state-level SNAP access for Black individuals on firearm deaths among Black youth, we used generalized linear models with a Poisson distribution with standard error estimates clustered at the state level. To adjust for the changing population size of Black youth, the log of the annual state population of Black youth was used as an offset in all models. For our main model, we examined the association of state-specific SNAP access for Black individuals with firearm deaths among Black youth, where state fixed effects accounted for differences between states that affect firearm mortality and year fixed effects accounted for changes over time in firearm mortality that are common across states. We further adjusted for potential confounding by including

additional economic and state firearm policy covariates, as well as percentages of Hispanic householders and Black householders, in our models; all covariates were lagged by one year. Separate models were estimated for each combination of age and firearm discharge intent. Additional models were estimated by lagging the SNAP access ratio along with state and year fixed effects by one year and lagging state demographic covariates by two years. While underpowered, an additional post-hoc sensitivity analysis estimated the association between SNAP access and firearms death restricted to the five states with SNAP estimates that were consistently highly reliable across all years. Given the loss in power due to the restriction to only five states, these models should be understood as complementary to our primary analyses. All analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC).

Results

Descriptive statistics

Table 1 summarizes the characteristics of 22 states included in the analysis, from 2000 to 2020. The mean

Table 1 Overall characteristics of States^a included in analyses measuring the impact of SNAP access on firearm deaths among black youth and young adults aged 10–34 years, 2000–2020

Characteristic	Value
States (N)	22
Mean (SD) gun law score ^b	66.77 (28.01)
Mean (SD) unemployment rate ^c	6.14 (2.03)
Mean (SD) gross state product (millions) ^c	521,961.26 (504,607.81)
Mean (SD) poverty rate ^c	13.80 (3.32)
Mean (SD) AFDC/TANF maximum monthly benefit for 3-person family ^c	361.80 (160.60)
Mean (SD) state minimum wage ^c	6.79 (1.60)
Mean (SD) percent Hispanic ^d	7.89 (7.85)
Mean (SD) percent Black ^d	19.68 (10.27)
Mean (SD) number of firearm deaths	
Accident	3.06 (2.64)
Suicide	24.07 (15.96)
Homicide	215.55 (104.13)
Unknown	1.35 (1.45)
All firearm deaths	244.04 (114.42)

^aStates restricted to those with reliable data ($n=22$ states: AL, AR, CA, DC, FL, GA, IL, IN, LA, MD, MI, MS, MO, NJ, NY, NC, OH, PA, SC, TN, TX, VA)

^bObtained from Traveler's Guide to the Firearms Laws of the Fifty States

^cObtained from National Welfare Data from the University of Kentucky Center for Poverty Research

^dObtained from ACS PUMS

$n=112,748$ (total number of firearm deaths across all state-years)

gun law score was 66.77 (SD=28.01), and the average unemployment rate was 6.14% (SD=2.03). Gross state product averaged \$521,961.26 million (SD = \$504,607.81), and the mean AFDC/TANF benefit for a 3-person family was \$361.80 (SD=160.60). The average poverty rate was 13.80% (SD=3.23), and the average state minimum wage was \$6.79 (SD=1.60). The mean percentage of Hispanic householders was 7.89% (SD=7.85), while the mean percentage of Black householders was 19.68% (SD=10.27). Regarding firearm deaths, the mean total was 244.04 (SD=114.42), with homicides, suicides, and accidental deaths averaging 215.55 (SD=104.13), 24.07 (SD=15.96), and 3.06 (SD=2.64), respectively.

Impact of SNAP access for black individuals on firearm deaths among black youth and young adults, 2000–2020

From 2000 to 2020, a 10-percentage point increase in state-level SNAP access for Black individuals was initially associated with an approximately 4% decrease (RR=0.96; 95% CI: 0.93, 0.99) in annual firearm deaths among Black youth and young adults, accounting for differences between states that affect firearm mortality and changes over time in firearm mortality that are common across states. This association was driven largely by changes in firearm deaths by homicide (RR=0.96; 95% CI: 0.92, 0.99). Further adjustment for time-varying state economic, policy, and demographic covariates that were lagged by one-year did not substantially change the association between SNAP access and all firearm deaths (RR=0.96; 95% CI: 0.93, 0.998). Lagging SNAP access with state and year fixed effects by one year and lagging state economic, policy, and demographic covariates by two years attenuated the association, and the estimate was not statistically significant (RR=0.97, 95% CI: 0.94, 1.01) (Table 2). Post-hoc sensitivity analysis restricting to highly reliable states were similarly not statistically significant (RR=0.98, 95%CI: 0.94, 1.02.)

In contrast, SNAP access initially had a smaller, but notable, association with suicide deaths, where an increase in SNAP access was associated with a slight reduction in suicides (RR=0.97; 95% CI: 0.94, 1.00) when only accounting for unchanging characteristics within states and common time trends. After adjusting for time-varying economic, policy, and demographic covariates that were lagged by one year, a 10-percentage point increase in state-level SNAP access was associated with a 4% decrease (RR=0.96; 95% CI: 0.94, 0.99) in suicide deaths, and when adjusting for one-year and two-year lagged predictor variables, the estimate of the association was fairly similar with a larger confidence interval (RR=0.96; 95% CI: 0.94, 0.99). These results suggest that higher SNAP access over time was associated with a small but significant reduction in suicide deaths among Black youth and young adults.

Table 2 SNAP access ratio for black Families^a and firearm deaths among black youth and young adults aged 10–34 years from 2000 to 2020 in the united States

	Model 1 ^b	Model 2 ^c	Model 3 ^d
Firearm Death Type	RR (95 CI%)	RR (95 CI%)	RR (95% CI)
Accidental	0.96 (0.87, 1.05)	1.02 (0.93, 1.12)	1.02 (0.90, 1.15)
Suicide	0.97 (0.94, 1.00)	0.96 (0.94, 0.99)	0.96 (0.92, 0.99)
Homicide	0.96 (0.92, 0.99)	0.96 (0.93, 1.00) ^e	0.97 (0.94, 1.01)
Unknown	0.95 (0.82, 1.11)	0.87 (0.73, 1.05)	0.89 (0.73, 1.08)
All firearm deaths	0.96 (0.93, 0.99)	0.96 (0.93, 1.00) ^e	0.97 (0.94, 1.01)

^aStates restricted to those with reliable data ($n=22$ states: AL, AR, CA, DC, FL, GA, IL, IN, LA, MD, MI, MS, MO, NJ, NY, NC, OH, PA, SC, TN, TX, VA)

^bSNAP access ratio with state and year fixed effects

^cContemporaneous SNAP access ratio with state and year fixed effects, and 1-year lagged covariates (economic covariates from UKCPR; percent Hispanic & percent Black from ACS PUMS)

^d1-year lagged SNAP access ratio with state and year fixed effects; 2-year lagged covariates (economic covariates from UKCPR; percent Hispanic & percent Black from ACS PUMS)

^e $p<0.05$

$n=112,748$ (total number of firearm deaths across all state-years)

Impact of SNAP access for black individuals on firearm deaths among black youth and young adults by age group, 2000–2020

The pattern of associations between SNAP access among Black youth and firearms deaths varied by developmental cohort, with stronger and more robust associations observed among younger groups (Table 3). Among those aged 10–18 years old, a 10-percentage point increase in state-level SNAP access was associated with an approximately 7% decrease ($RR=0.93$; 95% CI: 0.88, 0.98) in all annual firearm deaths among Black youth. This association persisted after adjusting for state-level time-varying economic, policy, and demographic covariates that were lagged by one year ($RR=0.93$, 95% CI: 0.88, 0.98) and was driven by a significant reduction in homicide deaths ($RR=0.92$, 95% CI: 0.88, 0.98). After incorporating a one-year lag for SNAP access and state and year fixed effects and a two-year lag for state-level time varying economic, policy, and demographic covariates, the association of SNAP access with firearm deaths remained significant ($RR=0.93$; 95% CI: 0.89, 0.98).

Among those aged 19–25, a 10-percentage point increase in state-level SNAP access was associated with an approximately 5% decrease ($RR=0.95$; 95% CI: 0.92,

Table 3 SNAP access ratio for black Families^a and firearm deaths among black youth and young adults by age group from 2000 to 2020 in the united States

	Model 1 ^b	Model 2 ^c	Model 3 ^d
Cohort	RR (95 CI%)	RR (95 CI%)	RR (95% CI)
<i>Age Group: 10–18 years old</i>			
Firearm death type: accidental	1.04 (0.89, 1.20)	1.07 (0.94, 1.22)	1.05 (0.86, 1.28)
Firearm death type: suicide	0.98 (0.90, 1.07)	0.99 (0.89, 1.10)	0.95 (0.86, 1.05)
Firearm death type: homicide	0.93 (0.88, 0.98)	0.92 (0.88, 0.98)	0.93 (0.89, 0.97)
Firearm death type: unknown	---	---	---
All firearm deaths	0.93 (0.88, 0.98)	0.93 (0.88, 0.98)	0.93 (0.89, 0.98)
<i>Age Group: 19–25 years old</i>			
Firearm death type: accidental	0.92 (0.80, 1.05)	1.01 (0.88, 1.16)	1.02 (0.89, 1.17)
Firearm death type: suicide	0.95 (0.91, 1.00)	0.94 (0.90, 0.99)	0.90 (0.85, 0.96)
Firearm death type: homicide	0.95 (0.92, 1.00) ^e	0.96 (0.92, 1.00)	0.96 (0.92, 1.00)
Firearm death type: unknown	1.02 (0.78, 1.34)	0.89 (0.68, 1.18)	1.06 (0.76, 1.47)
All firearm deaths	0.95 (0.92, 0.99)	0.96 (0.92, 1.00)	0.96 (0.92, 1.00) ^e
<i>Age Group: 26–34 years old</i>			
Firearm death type: accidental	0.92 (0.80, 1.06)	1.00 (0.84, 1.18)	1.00 (0.85, 1.18)
Firearm death type: suicide	0.98 (0.94, 1.02)	0.97 (0.92, 1.01)	0.99 (0.94, 1.05)
Firearm death type: homicide	0.97 (0.93, 1.00)	0.98 (0.95, 1.01)	1.00 (0.97, 1.03)
Firearm death type: unknown	---	---	---
All firearm deaths	0.97 (0.94, 1.00)	0.98 (0.95, 1.01)	1.00 (0.97, 1.03)

^aStates restricted to those with reliable data ($n=22$ states: AL, AR, CA, DC, FL, GA, IL, IN, LA, MD, MI, MS, MO, NJ, NY, NC, OH, PA, SC, TN, TX, VA)

^bSNAP access ratio with state and year fixed effects

^cContemporaneous SNAP access ratio with state and year fixed effects, and 1-year lagged covariates (economic covariates from UKCPR; percent Hispanic & percent Black from ACS PUMS)

^d1-year lagged SNAP access ratio with state and year fixed effects; 2-year lagged covariates (economic covariates from UKCPR; percent Hispanic & percent Black from ACS PUMS)

^e $p<0.05$

Firearm deaths across states: $n=112,748$ (10–18 year olds: $n=23,140$; 19–25 year olds: $n=37,607$; 26–34 year olds: $n=52,001$)

0.99) in annual firearm deaths among Black young adults in initial models; and was largely driven by the association between SNAP access and firearm homicides (RR=0.95; 95% CI: 0.92, 0.996) and suicides (RR=0.95, 95% CI: 0.92, 1.00). Similar to the results from all Black youth and young adults (ages 10–34), adjustment for 1-year lagged state economic, demographic, and policy covariates attenuated the association between SNAP access and annual firearm deaths and the estimates were not statistically significant (RR=0.96; 95% CI: 0.92, 1.00). Upon adding a one-year lag to SNAP access and state and year fixed effects along with a two-year lag to state economic, policy, and demographic covariates, the association with suicide remained statistically significant (RR=0.90, 95% CI: 0.85, 0.96), while the association with homicide was not statistically significant (RR=0.96, 95% CI: 0.90, 1.00).

Among those aged 26–34, no statistically significant association was found between SNAP access and firearms deaths for any model specification. This cohort showed consistent results across all death types, with risk ratios near 1.00.

Discussion

This study provides novel evidence on the role of SNAP access for Black individuals in reducing firearm mortality among Black youth, with particularly notable protective associations observed for adolescents aged 10–18 years. The consistent inverse association between SNAP access and firearm homicides aligns with pediatric health literature emphasizing the critical role of family economic stability in promoting youth safety and well-being [8]. Our findings regarding firearm suicide are also noteworthy, with stronger associations emerging when accounting for time lags in our models, particularly among young adults aged 19–25 years. This pattern suggests that the protective associations of economic security policies on suicide may develop over time, with the one-year lagged model showing a significant 10% reduction in suicide risk (RR=0.90; 95% CI: 0.85–0.96) among those aged 19–25. This delayed association may reflect the development of improved mental health trajectories and decreased psychological distress over time [31].

The divergent patterns across causes of death suggest that economic security programs like SNAP may be associated with various types of firearm mortality through different pathways, highlighting the need for comprehensive approaches that address both economic factors and other social determinants of firearm violence. The differential findings across age groups further underscore the importance of considering developmental context when designing and implementing prevention strategies.

The protective associations of SNAP access on firearm homicides are notably given Black males aged 15–34 are

most at risk for gun homicides, making up 2% of the U.S. population but 34% of gun homicide victims in 2022 [32]. Their homicide rate is 24 times higher than that of white males in the same age group. Black females in this age range also face a firearm homicide rate nine times higher than their white peers. This protective association likely stems from several key mechanisms relevant to pediatric health. First, reduced household economic stress can decrease family conflict and community violence exposure [8]. Research has shown that financial strain contributes to increased aggression and violent behavior, particularly in communities with limited resources. Second, improved food security supports healthy youth development and behavioral regulation. Studies have demonstrated links between nutritional status and cognitive function, emotional regulation, and risk-taking behavior [8]. Third, enhanced neighborhood stability through increased economic resources can strengthen community protective factors [33]. These mechanisms appear particularly salient during adolescence [6], explaining the stronger and more persistent associations observed among youth aged 10–18 years, where the protective association remained significant even in our one-year lagged model.

The differential impact of access to SNAP across age groups and causes of death provides important insights for intervention design, especially given that firearm-related homicide became the leading cause of death in 2021 among Black males ages 15–34 [32]. The stronger protective association observed among adolescents highlights the particular importance of economic support during critical developmental periods when youth are most vulnerable to community violence exposure. This finding aligns with developmental research showing increased susceptibility to environmental influences during early and middle adolescence [33]. Our lagged models revealed significant protective associations with both overall firearm mortality and suicide among young adults aged 19–25 years, suggesting that economic security programs may have delayed protective effects that manifest over time for this age group. The significant findings in our time-lagged models suggest that economic stability may be associated with reduced suicide risk by alleviating financial distress, enhancing access to mental health resources, and strengthening social support networks. These delayed associations may reflect the cumulative impact of economic security on psychological well-being and community conditions over time.

Our findings contribute to the growing literature on structural interventions for youth violence prevention in several ways. First, they demonstrate the potential of broad-based economic support programs to reduce firearm violence, extending previous work focused primarily on targeted violence prevention initiatives. Second, they

highlight the importance of considering developmental timing in policy implementation, suggesting that adolescence may represent a particularly effective intervention point for homicide prevention, while young adulthood may be critical for suicide prevention [34]. Third, they provide evidence for the role of state-level policy decisions in shaping local health outcomes, supporting calls for policy-level interventions to address health disparities.

Several limitations warrant consideration. Variability in race classification on death certificates introduced measurement challenges forcing us to restrict our analyses to years up through 2020. Our reliance on state-level SNAP access measures may mask important local variations in program access and effectiveness. Additionally, our SNAP measure was estimated from existing data, which introduces additional statistical uncertainty to our estimates. While we controlled for key covariates, unmeasured confounding factors such as community-level firearm ownership rates and the availability of local violence prevention programs may have influenced results. Additionally, data limitations did not allow for race-specific measures of these key confounders. Finally, analyses of suicides and accidental deaths were limited by smaller event numbers, potentially affecting statistical power.

These findings suggest several key directions for pediatric health policy and practice. First, expanding SNAP benefits could serve as an upstream strategy for reducing firearm violence exposure among Black youth. Recent literature indicates that pediatric healthcare providers can play an important role in screening for social needs [35, 36], such as food insecurity to facilitate SNAP enrollment and other resource linkages among at-risk families, particularly those with adolescent children. Second, integrating economic support programs with community- and school-based youth violence prevention initiatives could enhance protective associations. This might include co-locating services or developing coordinated referral systems between social services and violence prevention programs. Third, special attention should focus on families with school-aged children, given the critical role of economic stability during adolescent development.

Future research should address several key questions raised by this study. First, investigators should explore potential mechanisms via qualitative analysis through which SNAP access influences community stability, community resources, social mobility, and social cohesion, focusing on how these factors mediate the relationship between economic support and firearm mortality. Second, studies should examine the combined associations of SNAP and other welfare policies to understand their collective impact on reducing firearm violence. Finally, longitudinal studies examining the temporal dynamics of SNAP benefits and their associations on long-term

violence trends would offer valuable insights for designing sustainable interventions.

Conclusion

This study suggests that increased SNAP access may be associated with reduced firearm homicide among Black youth, particularly those aged 10–18 years, though further research is needed to establish causality. Additionally, our findings suggest a potential protective relationship between SNAP access and firearm suicide among young adults aged 19–25 years, particularly when accounting for time lags. The age-specific and cause-specific patterns observed suggest that policy effectiveness may vary across developmental periods and types of firearm violence, highlighting the need for targeted and developmentally informed approaches.

These findings reinforce the need for holistic approaches to reducing health disparities driven by structural racism and socioeconomic inequities. Future research should explore the mechanisms underlying these relationships, examine the combined associations of SNAP with other safety net policies, and assess long-term impacts of economic support programs on firearm violence trends. By prioritizing evidence-based social policy interventions, policymakers can address the root causes of firearm violence and promote safety and well-being among Black communities disproportionately burdened by this public health crisis.

Abbreviations

ACS	The Census Bureau's American Community Survey
AFDC	Aid to Families with Dependent Children
PAI	Program Access Index
PUMS	Public Use Microdata Sample
SNAP	Supplemental Nutrition Assistance Program
TANF	Temporary Assistance for Needy Families

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Author contributions

EDJ wrote the original draft of the introduction, discussion, and conclusion sections and participated in manuscript revision. BWJ and MDL supervised the project, obtained funding, and provided critical review of the methodology. CH and MDL designed and conducted the statistical analyses of SNAP and mortality data and prepared Table 1, and 2. KK contributed to study design and interpretation of results. TJ conducted the literature review, edited the manuscript, and managed citations. All authors reviewed the manuscript.

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Data availability

The datasets generated and/or analyzed during the current study are available in The Census Bureau's American Community Survey (ACS) Public Use Microdata Sample repository, <https://www.census.gov/programs-surveys/acs>.

Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Review Board of Emory University (Protocol number: STUDY00006896). As this study analyzed de-identified secondary data from publicly available sources, the IRB determined that informed consent was not required. This research adheres to the ethical principles for research involving human data as outlined in the Declaration of Helsinki.

Consent for publication

N/A.

Competing interests

The authors declare no competing interests.

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