






Evaluating the Feasibility of a Novel Firearm Injury Prevention Program for Pre-adolescent Children Through Health Care and Community-Based Partnerships: The *Future Healers* Program Pilot Study

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Abstract

Background: Firearm violence is an American public health crisis that negatively impacts children and disproportionately affects Black youth. Few firearm injury prevention programs have been described in pre-adolescent children. The *Future Healers* Program is a novel collaboration constructed via partnership between the medical school, trauma center, academic surgery department, and local non-profit community organization. Our study sought to evaluate if (1) partnering with community organizations facilitated recruitment of children with prior exposure to firearm violence and (2) the health care community was a potential trusted partner appropriate for program delivery.

Methods: Children aged 4-13 were recruited to join the program via news outlets and social media and in partnership with a local non-profit organization. Of the children and parents participating in the program, 48% (44/92) and 59% (38/64), respectively, completed an IRB-approved survey study. Pearson's chi-square, percentages, and 95% confidence intervals evaluated differences between children and caregivers on sociodemographic characteristics, firearm exposure (FE), firearm violence exposure (FVE), and perception of health care. Participant's residence was geocoded in relationship to incidents of firearm injury (2008-2021) in the same region.

Results: Caregivers (95%) and children (84%) reported substantial exposure to firearm violence and resided in areas with frequent firearm injury incidents. Notably, 82% of caregivers and 66% of children reported having a family member injured by gunfire. A high percentage of caregivers (79%) and children (91%) self-reported trust in the health care system.

Conclusion: Partnerships between community organizations and health care systems can develop prevention programs that effectively recruit and engage pre-adolescent children impacted by firearm violence.

Keywords

pediatric trauma, trauma, prevention, firearm violence, adverse childhood experiences

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Data Availability Statement included at the end of the article.

Background

Firearm injury is the leading cause of death in children and adolescents in the United States (US).¹ In 2020, firearms constituted 64% of US children/adolescent homicides and 79% of all homicides.¹ The complex sociological and political factors entrenched in the alarming rise of US firearm violence have generated calls to develop comprehensive approaches to this issue and, specifically, firearm injury prevention programs.¹⁻⁴ The US Justice Department suggests that firearm injury prevention programs contain several tenets, including research, hospital-based prevention, and community involvement. Although many of these programs have significant community impact, most have focused on adolescents and young adults rather than pre-adolescents.⁵ Firearm homicide rates are highest in non-Hispanic Black individuals, regardless of age;^{1,2} therefore, it is imperative to have effective prevention programming focused on Black pre-adolescent youth.

Few studies have examined childhood firearm violence exposure (FVE), reporting how children are experiencing indirect and direct firearm violence at an early stage.^{5,6} Exposure to firearm violence is an example of an adverse childhood experience (ACE) which are defined as stressors following traumatic events that can accumulate into toxic stress and harm one's overall health.⁷ Current literature documents the negative long-term consequences of ACEs and general strategies to mitigate their effects.⁷⁻⁹ However, there has been minimal investigation on youth firearm violence specifically in relation to ACEs and the potential efficacy of intervention programs to mitigate trauma impact in younger age groups. Fundamental questions remain unanswered on who should deliver these programs and how to recruit and engage children at risk of firearm injury.

In the Louisville, Kentucky (the study region), there is substantial morbidity and mortality attributable to firearm violence. A collaborative database reported an overall incidence of 129 firearm injuries per 100,000 individuals in 2021 in the same region, with 664 out of 4266 gunshot injuries occurring in individuals under 18 years of age between 2017 and 2021.¹⁰ During the height of the COVID-19 pandemic, the associated morbidity and mortality in the city increased significantly, with twice as many years of potential life lost to firearm violence as to COVID-19, thereby highlighting the overwhelming burden of this issue inflicted upon young, Black individuals.¹¹⁻¹³

By creating the *Future Healers* program with a novel multi-partner structure (Figure 1), our study aims to provide insight relevant to the construction and delivery of a prevention program to youth at risk for firearm injury during the pre-adolescent stage of development. We recruited children aged 4 to 13 in the metropolitan region. *Successful recruitment was primarily facilitated through partnership with the Christopher 2X Game Changers organization, which had a long-standing history of building a network of support to*

individuals impacted by violence in our community. Children and families were invited to participate in the monthly sessions incorporating medical education, mentorship, community support, and wellness interventions. The sessions occurred at accessible and centralized sites, such as the University of Louisville Hospital, the Chestnut Street Family YMCA, and The Galt House Hotel, for the children and caregivers to attend. We invited program participants (children and their caregivers) to complete surveys to evaluate if (1) intentional partnership with community organizations resulted in the successful recruitment of children with prior exposure to firearm violence, (2) level of FVE in the local community is as high as local data reports, and (3) if children and caregivers program participants participating in the prevention program perceived the health care community as a trusted partner in their overall health and well-being.

Methods

The EQUATOR network guideline was used to ensure proper reporting of methods, results, and discussion (SDC 1). Children between the ages of 4-13 were recruited to join the *Future Healers* program through advertising, news reports, social media, and local partner organizations, including the Chestnut Street Family YMCA¹⁴ and Christopher 2X Game Changers.¹⁵ Many participants had a pre-existing connection with Christopher 2X Game Changers, a nonprofit organization that engages victims of firearm violence and promotes early childhood education to end violence long term. This study was conducted following review and approval by the Institutional Review Board (IRB) (#22.0243).

Children and caregivers registered in the *Future Healers* program who partook in at least one programming event were eligible to participate in this study. In total at the time of the survey, 92 children and 64 parents met these criteria. Staff members provided IRB-approved survey recruitment letters in person at two *Future Healers* program events and electronically via email. The letter briefly explained the purpose of the study, the information gained from the study, the risks, and the contact information of the study group. Before completing the survey, the children and caregivers signed IRB-approved assent and informed consent forms. The children and caregivers completed a paper copy or computer-based survey via Qualtrics at *Future Healers'* events or electronically over 3 months (June to August 2022). The study participants received a \$5 gift card following completion of the survey.

Primary Outcome Measures

The study's primary outcomes included (1) prior FVE amongst participants and (2) the perception of the health care community from the child and caregiver. Firearm violence exposure was assessed through 5 questions: (1) firearm injury to a friend, (2) firearm injury to a family member, (3) personal

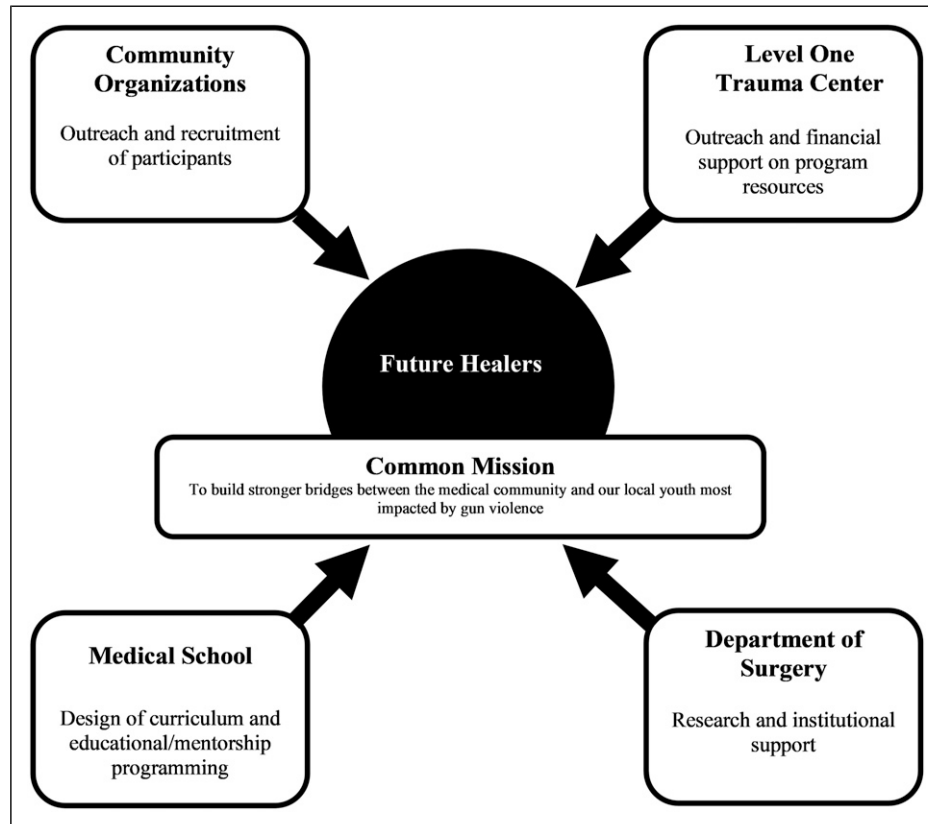


Figure 1. Partnership structure of *Future Healers*.

firearm injury, (4) visual witness to firearm shooting, or (5) audible witness to firearm shooting on more than a monthly occasion. Additionally, we asked questions related to firearm accessibility and safety in the home. We gauged study participants' perceptions of health care by evaluating their trust in the health care system, personal experiences with health care providers, and career aspirations. Demographic measures included age, gender, race and residential address, school/employment status, and event accessibility. The surveys were modeled after the Adverse Childhood Experience (ACE) Questionnaire but were adapted to focus on gun violence exposure as an ACE.

Statistical Analysis

We used univariate statistics (frequencies, percentages, means, and standard deviations) to describe the demographic makeup of the participants and used the Clopper-Pearson exact 95% confidence intervals to get estimates of prevalence of the FVE and perception of health care questions. Pearson's chi-square test compared caregivers and children on the FVE and health care questions. A power analysis was performed with an estimated sample proportion of .50 to determine a minimum required sample size of $n = 70$ to produce a 95% confidence interval of .38 to .62. All statistical tests comparing caregiver and children's responses were two-tailed, and the significance level was set by

convention at $P < .05$. Statistical analysis was completed using IBM SPSS Statistics for Windows, version 28 (IBM Corp., Armonk, NY, USA). Each participant's residential address at the time of survey completion was geocoded and assigned to a census tract. Firearm injury incidents were similarly geocoded from a collaborative firearm injury database, and the total number of firearm-related injuries was aggregated within each of the region's 191 census tracts. Maps illustrating the overlay between firearm injuries and participants' residential addresses were created to highlight similarities in their spatial distributions. ArcGIS Pro software (v3.0.3ESRI, Redlands, CA, USA) was used for all spatial analyses.

Results

Of the 92 children and 64 caregivers participating in the program as of the study date, 44 (48%) and 38 (59%) successfully completed the survey, allowing for a 52.5% response rate. Survey questions were divided into 3 overarching categories: demographic information, firearm violence exposure, and perceptions of the health care community.

Demographic Characteristics

Demographic information can be found in [Table 1](#). Male (41%) and female (59%) children participated in the survey, with an

average age of 8.8 years (SD = 3.3). Three-fourths of the children attended public school. Caregivers were predominantly female (84%), and the average age of all caregivers at program events was 39 years (SD = 9.3). Regardless of age and gender, 97% of all participants identified as non-Hispanic Black/African American. Most of the participants (96%) lived in the metropolitan area, with the remaining residing in close proximity. Overall, 36% of participants lived in the Downtown/West area, 24% in South area, and 36% in East areas.

Firearm Violence Exposure and Accessibility and Safety in the Home

While caregivers and children were asked similar questions, different wording was used to accommodate the respective participants. Questions and results are demonstrated in Figures 2 and 3. Caregivers reported hearing gunshots in their neighborhood more frequently than children (66% vs 50%, respectively, $P = .154$) and witnessing firearm violence in person at significantly higher rates (caregivers 65%; children 21%, $P = .001$). Regardless of the frequency of hearing or seeing gunshots, nearly all survey participants stated that the current presence of guns in their neighborhood had them concerned for their children's safety or, if they were a child, their own safety (caregivers: 92%; children: 95%, $P = .661$). Although 13% of caregivers and 2% ($P = .091$) of children were personally injured by a firearm, many adult survey respondents had a friend (84%) or family member (82%) directly affected by firearm violence. For children, 30% had a friend directly injured and 66% had a family member injured as a result of firearm violence. Overall, 95% of caregivers and 84% of children ($P = .166$) had experienced at least one of the 5 FVE questions assessed in this study.

Caregivers and children were equally likely to report that firearms were stored in their home (50% vs 50%, respectively) with 90% of adults and 70% of children reporting that guns were safely secured in a gun lock; however, only 2% of children reported that they could access that firearm.

Participant Residence in Relation to Reported Firearm Injury Incidents

Figure 4 demonstrates the participants' residence locations in relation to firearm injury incidents as determined by a collaborative database.¹⁰ Although the children participating in the program were from many areas of the city, most were proximate to recent gun violence incidents. The median distance from the residence of a child to the nearest gunshot incident that occurred in the past year was 470 meters and the median distance to the nearest gunshot incident that occurred in the past 3 years was 280 meters. More than 60% of the children lived within 400 meters of a gunshot incident that occurred in the past year. These nearby instances of gun violence were not exceptional cases. There was a median of

Table 1. Sociodemographic Characteristics of Caregiver and Children Participants.

Children Baseline Characteristics	Children (n = 44)
Gender, % (n)	
Female	59 (26)
Male	41 (18)
Race, % (n)	
Black/African American	95 (42)
Asian	3 (1)
No response	3 (1)
Age, mean (SD)	8.8 (3.3)
Type of school % (n)	
Public	75 (33)
Private	5 (2)
Homeschool	2 (1)
Unknown	7 (3)
No response	11 (5)
Primary transportation to events, % (n)	
Personal vehicle	97 (37)
Public transportation	3 (1)
Siblings in program, % (n)	
Yes	50 (21)
No	50 (21)
Children in program, mean (SD)	1.42 (0.72)
Caregivers Baseline Characteristics	Caregivers (n = 38)
Gender, % (n)	
Female	84 (32)
Male	16 (6)
Race, % (n)	
Black/African American	94 (36)
Asian	3 (1)
No response	3 (1)
Age, mean (SD)	39 (9.3)
Employment status (n)	
Full-time	26 (68)
Part-time	3 (8)
Free-lance	1 (3)
Unemployed	8 (21)
Primary transportation to events, % (n)	
Personal vehicle	97 (37)
Public transportation	3 (1)
Children in family, mean (SD)	2.71 (1.84)
Children in program, mean (SD)	1.42 (0.72)

5 gunshot injury incidents that occurred within the past 3 years within a half-mile of the participating kids. The home of one child was within 400 meters of 51 gunshot incidents that occurred in the past 3 years.

Perception of the Health Care System

The results in Table 2 demonstrate that most caregivers (79%) and children (91%) trusted the health care system. When asked if

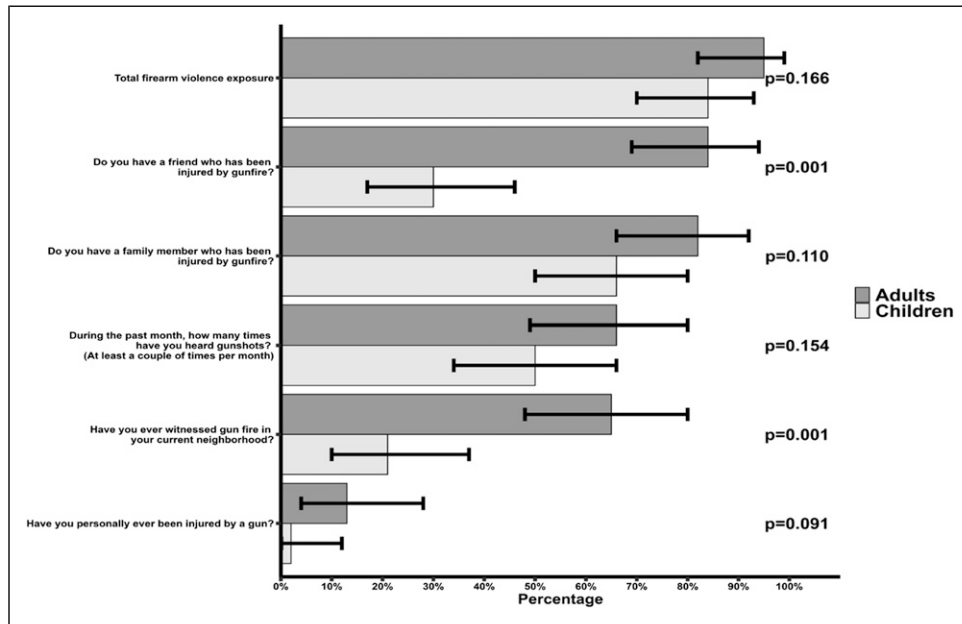


Figure 2. Firearm exposure in caregivers and children participants.

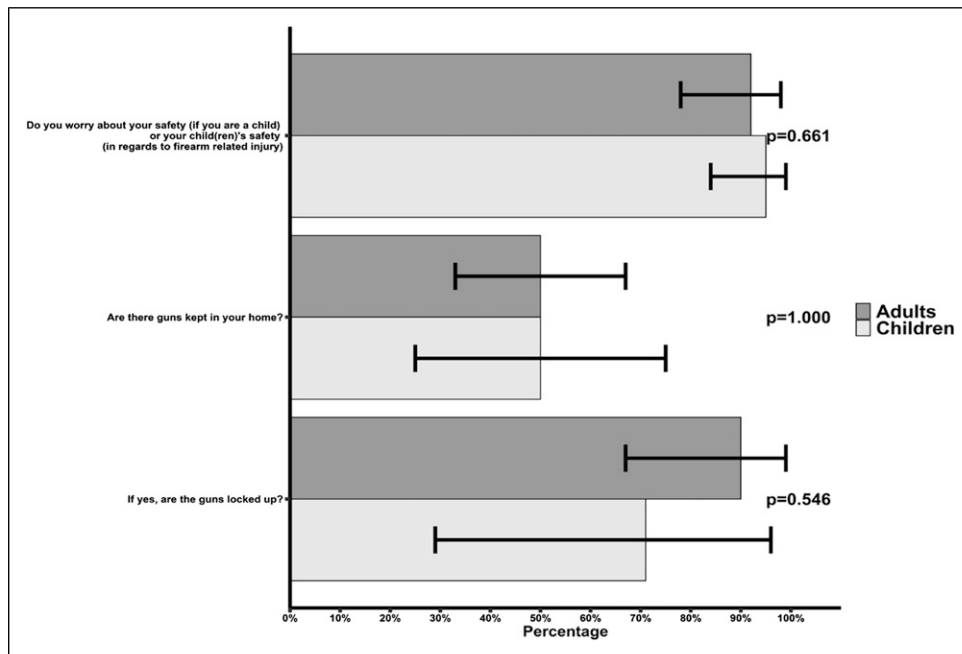


Figure 3. Firearm violence exposure in caregivers and children participants.

they had a negative experience when visiting the doctor’s office or hospital, 37% of caregivers and 17% of children reported “yes.” There was an apparent difference in how children and caregivers interpreted this question. The children tended to describe instances where they received certain treatments that may elicit a negative response, such as “receiving a shot,” as a

negative experience compared to caregivers detailing interactions in which they were not listened to by their provider. Most children (60%) believed they could become health care providers such as physicians or nurses, and 53% of children listed a medical/STEM profession when asked what they wanted to be when they grew up.

Discussion

The rise of community firearm violence in the US has drastically impacted and shortened the lives of our youth, especially those from marginalized populations. The FVE in our study was defined as a participant affirming that they have experienced an injury to a friend or family member, personal injury, or audible/visual witness to gunfire on more than a monthly occasion. This study found that caregivers and children in the *Future Healers* program reported a high percentage of total FVE, with a third of the children having a peer injured by gunfire. Although the majority of our study group had a positive perception of the health care system, there were several reports of negative interactions with health care providers as well, thereby reaffirming the importance of partnerships with credible community partners.

For health care entities to recruit and engage children at highest risk of injury, community partners that are trusted and

credible to the population that is being served are essential. Through partnerships with community groups such as Christopher 2X Game Changers, the *Future Healers* program appropriately engaged children most at risk of firearm violence, as shown through our results. A large majority of the caregivers (96%) and children (86%) had been exposed to firearm violence. Half of the children in our study had heard gunshots fired in the past month and a third had a similarly aged peer injured by gunfire. Again, this is a sobering number given that the children were all under the age of 13. This exposure is significantly higher than a previous study that reported 36% of children aged 5-12 in Boston, Philadelphia, and rural Tennessee had experienced indirect firearm violence in their lifetime.⁵ Our study's higher percentage of FVE is consistent with our objective to recruit and engage children at increased risk for gun violence.

As has been demonstrated in multiple American cities, there are significant geospatial disparities in our community relevant to the incidence of firearm injury.^{16,17} As demonstrated in

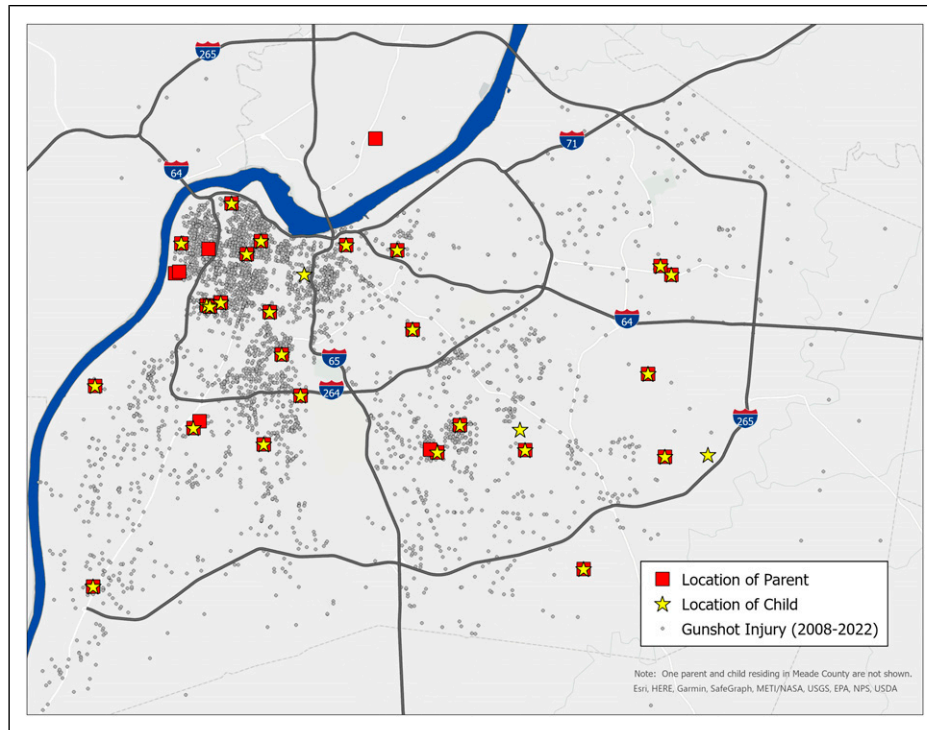


Figure 4. Firearm injury vs participants' residences in metro area.

Table 2. Participant Trust in the Health Care Community.

	Count/Total (Affirmative)	Proportion (95% CI)
Caregivers		
If you are hurt or sick, do you trust the health care system to take care of you?	30/38	0.79 (0.63, 0.90)
Have you ever had a bad experience when seeing a doctor?	14/38	0.37 (0.22, 0.54)
Children		
When you're sick, do you trust doctors to take good care of you?	39/43	0.91 (0.78, 0.97)
Have you ever had a bad experience at the doctor's office or hospital?	7/42	0.17 (0.07, 0.31)

Figure 2, children and caregiver program participants resided in neighborhoods within the study region with a high incidence of firearm injury. Their communities were regularly subjected to gunfire and injury, and these areas have experienced a long-standing history of targeted disinvestment highlighted by historical policies and structural racism.¹⁶⁻¹⁹ One clear objective of the *Future Healers* program is to combat historical targeted disinvestment in these communities with investment in the youngest members of these communities and their families.

Additionally, our results indicate that health care entities, including medical schools/students and trauma centers, can serve as trusted partners in the implementation and delivery of prevention programming. Children who were screened by their physicians early for gun-safety interventions had significantly higher rates of handgun removal or safe storage when compared to those with no counseling from physicians.^{9,20} The children surveyed in our study had an overwhelmingly positive perception of health care providers. Although there was a decrease in the caregivers' perceptions compared to the children, almost 80% had a positive perception of health care providers. The frequent interactions between families and health care workers in *Future Healers* may have influenced the positive response. However, some caregivers documented negative encounters at doctor visits or hospital stays that were often due to the health care providers' dismissiveness of their medical concerns. Systemic racism and discriminatory practices continue to impact the overall care of Black patients and their communities.²¹⁻²³ Despite these promising results, we must continue to rebuild trust in these communities that have been ignored and mistreated for too long.

Most children (60%) in our study believed they could become health care providers such as physicians or nurses, and 53% of children listed a medical/STEM profession when asked what they wanted to be when they grew up. The *Future Healers* program is intended to immerse the children in an environment with medical students and providers with whom they may better relate. These unique experiences would otherwise not have been available to these participants outside the program. The *Future Healers* program is an attempt to provide a fresh perspective in this realm by building relationships, cultivating mentorship, and intertwining medicine with wellness for youth.

The authors acknowledge the limitations of this study. The response rate of 52% was low, given the 3-month timeframe given to participants in the program. Various forms of communication, such as email, text messaging, and in-person distribution, helped to garner responses. However, low participation may stem from a fundamental distrust of the research community and participation in such studies due to past discriminatory acts that severely damaged the Black community.²⁴

The objective of this study was to ascertain if the program was successfully recruiting children and families that had experienced firearm violence. Given that the results of the survey were representative of individuals

already involved in the Future Healers program, results are not necessarily generalizable to the community as a whole with regard to firearm violence exposure and perceptions of health care institutions. Results from children and caregivers were not combined among families, which could also limit the generalizability of the results. The perception of the children and caregivers individually was the primary focus of the study, but the results of children's surveys could have been influenced by the presence of the parents. Most participants were recruited from our partnered local community organizations, allowing for efficient targeting through working with organizations with known relationships with this set population. However, recruitment efforts may not have reached impacted individuals not affiliated with community organizers. Further investigations are needed to assess the effectiveness and perception of firearm violence prevention programs on children and their caregivers. Longitudinal evaluation will allow further information to demonstrate if early intervention equates to lasting changes in a child's adult years. Additionally, it will be necessary to evaluate potential factors associated with program adherence, attendance, and engagement by participants and their caregivers. Future studies are also needed to assess the impact on medical students' personal and professional identity formation as leaders of *Future Healers* programming and evaluation.

Conclusion

The significant incidence of childhood firearm violence exposure necessitates innovative interventions tailored for this marginalized population. In this study, within the context of a novel pre-adolescent violent injury prevention program (*Future Healers*), we demonstrated that partnership with local community organizations successfully facilitated the recruitment of young children with significant exposure to firearm violence. We found that children and their caregivers had a positive overall perception of the health care community, thereby suggesting that health care entities can serve as a trusted partner with community organizations to deliver injury prevention programming during this critical period of development.

Author's Note

A version of this work was presented in oral format at the Kentucky American College of Surgeons Chapter Conference.

Author Contributions

All authors have made substantial contributions to (a) conception and design, or acquisition of data, or analysis and interpretation of data; and/or (b) drafting the article or revising it critically for import intellectual content; and/or (c) final approval of the version to be published.

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Data statement: the research data is confidential.

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