



**2022 NATIONAL
RESEARCH CONFERENCE**
FIREARM INJURY PREVENTION

Washington, D.C.
November 29-December 1

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Session 1: Advancing solutions to prevent firearm-related suicide

Congressional Rooms, November 30, 10:15 - 11:45 AM

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1. Firearm Licensure, Lead Levels and Suicides in Massachusetts

Christian Hoover BA¹, Aaron Specht PhD², David Hemenway PhD¹

¹Harvard Injury Control Research Center, Department of Health Policy, Harvard School of Public Health, ²School of Health Sciences, Purdue University

Statement of Purpose: Suicide is the second leading cause of injury death in the United States. Over half of recent suicides were firearm suicides. A largely overlooked factor connecting firearms and suicide is lead exposure. Lead bullets and primers are used throughout the United States and pose great risk to both adults and children. Lead is inconsistently linked to mental illness but remains linked to an increased prevalence of suicide. No research exists documenting the relationship among firearms, lead exposure, and suicide. **Methods/Approach:** We collected data for all 351 sub-counties in Massachusetts between 2011-2019 regarding the number of class A firearm licenses, the number of suicides, prevalence of blood lead levels, and covariates. We hypothesized that; 1) places with higher levels of gun ownership will have higher levels of gun suicide rates but gun ownership levels have little relationship with non-gun suicide; 2) places with higher levels of gun ownership would have higher rates of lead exposure; 3) higher blood lead levels would be associated with higher rates of suicide by all methods. **Results/Conclusion:** Individuals living in towns with higher rates of firearm licenses were significantly more likely to die in gun suicides and all suicide types. They were not more or less likely to die from suicides by means other than guns. Lead levels were a predictor of gun suicide, non-gun suicide and total suicide, although its relationship with gun suicide became non-significant with the inclusion of licensure. Licensure was the greatest predictor of lead levels when compared to other exposure sources. **Innovation & Significance to Field:** Our study appears to be the first to show the established gun-suicide relationships holds within political areas in a single state. We provide evidence towards the link between lead exposure and suicide and expand our earlier work showing the link between gun prevalence and elevated pediatric blood lead levels.

2. Effect of Mass Communication on Veteran Suicide Prevention: Help Seeking & Firearm Safety Behaviors

Bertrand D. Berger PhD¹, Daniel Buttery², Sara Kohlbeck MPH³, Stephen Hargarten MD, MPH³

¹Psychiatry and Behavioral Medicine, Medical College of Wisconsin & Zablocki VAMC, Milwaukee, WI, ²War Memorial Center, Milwaukee, WI, ³Comprehensive Injury Center, Medical College of Wisconsin, Milwaukee, WI

Statement of Purpose: In the State of Wisconsin, the suicide rate increased by 40% from 2000 to 2017, has been higher than the national rate. The suicide rate among Wisconsin Veterans has also been increasing over the past 20 years and in 2017, accounting for age differences, the rate was significantly higher than the national Veteran suicide rate, the national suicide rate, and the Wisconsin suicide rate. Veterans who die by suicide are more likely to use a firearm, to have physical health problems, and to have experienced a recent death of a friend or family. A viable suicide prevention strategy is to promote, educate, and encourage people to seek help when in a crisis and to decrease their access to lethal means (e.g., to voluntarily more safely storage firearms and ideally store them outside of the home during a crisis). **Methods/Approach:** This study conducted a statewide mass media and social media public health messaging campaign designed to increase help seeking behavior and decrease the incidence of firearm suicides among Veterans using messaging that has been specifically designed and promoted by Veterans through focus groups and message testing/refinement over the course of 6 months. **Results/Conclusion:** Message effectiveness was measured by tracking website traffic to a landing website and surveying a representative subject pool of Wisconsin residents at baseline (prior to advertising) and after the first of 2 advertising campaigns. Our preliminary results indicate the advertising message was seen by 95% of Veterans and differences in Veteran and non-Veterans' intent to seek help and safely store firearms. **Innovation & Significance to Field:** We have digital, video and audio advertising samples that effectively drew people to landing website and preliminary survey data shows an association with increased help seeking behavior and intent to safer storage of firearms.

3. An experimental test of safe firearm storage messaging in a sample of firearm-owning United States military service members

Michael D. Anestis PhD¹, Craig J. Bryan PsyD ABPP², Daniel W. Capron PhD³, AnnaBelle O. Bryan M.S.²

¹New Jersey Gun Violence Research Center; School of Public Health, Rutgers, the State University of New Jersey,

²Department of Psychiatry and Behavioral Health; Ohio State University Wexner Medical Center, ³School of Psychology, University of Southern Mississippi

Statement of Purpose: Nearly two-thirds of military suicides involve firearms and safe firearm storage is rare. We examined if firearm-owning servicemembers endorse greater openness to safe firearm storage depending upon the content of a visual message they are randomly assigned to view. **Methods/Approach:** Participants were randomized to view a visual message on safe firearm storage (3x2x2 factorial design). Willingness to utilize safe firearm storage practices was assessed immediately prior to and following exposure. Participants (n = 719) were recruited using the KnowledgePanel Calibration approach to combine KnowledgePanel and opt-in samples into a single representative sample. Inclusion criteria included current membership in the US military and current firearm ownership. Messages shared the same image and text on safe firearm storage, but varied in messenger occupation (primary care physician, security forces, combat controller), the presence of text validating the perspective of firearm owners, and the presence of text validating the drive for home protection. We assessed for changes in willingness to utilize four at-home (unloaded, separate from ammunition, in a locked location, with a locking device) and three away-from-home (with family or friend, at a firearm retailer, at a law enforcement agency) firearm storage practices. **Results/Conclusion:** Participants ($M_{age} = 33.64$) were predominantly male (80.4%) and White (71.4%). The interaction of time and the three message factors was significant for storing firearms separately from ammunition ($p\eta^2 = .015$). For all other storage practices, we examined two-way interactions ($p\eta^2$ range = .013 - .025). Willingness increased most consistently in conditions featuring security forces, whereas 80% of decreases in willingness included the primary care physician. **Innovation & Significance to Field:** Security forces may be a trusted voice in safe firearm storage messaging. The scalability and potential for repeated exposures may render messaging effective for promoting safe firearm storage at the population level.

4. Firearms and suicidal ideation among young adults experiencing homelessness

Anthony Fulginiti PhD¹, Hsun-Ta Hsu PhD², Robin Petering PhD³, Anamika Barman-Adhikari PhD¹, Kristin Ferguson PhD⁴, Sarah Narendorf PhD⁵, Jama Shelton PhD⁶, Diane Santa Maria DrPH⁷, Kimberly Bender PhD¹

¹School of Social Work, University of Denver, ²School of Social Work, University of Missouri – Columbia, ³Lens. Co.,

⁴School of Social Work, Arizona State University, ⁵College of Social Work, University of Houston, ⁶Silberman School of Social Work, Hunter College, ⁷Cizik School of Nursing, University of Texas Health Science Center at Houston

Statement of Purpose: Young adults experiencing homelessness (YAEH) are at elevated suicide risk. Although a strong link exists between firearms as a suicide method and mortality in the general population, limited research has focused on the role of firearms in relation to suicidal experiences among YAEH. Given that suicidal ideation is a common precursor to suicidal behavior, this study had two aims: (1) examine the association between firearm violence exposure and suicidal ideation (2) examine the association between firearm access and suicidal ideation. **Methods/Approach:** YAEH (n= 1,426) in seven cities across the U.S. were surveyed. Logistic regression analyses were conducted to examine the associations between: (1) three types of lifetime firearm violence exposure (i.e., direct victimization, indirect victimization, and perpetration) and past-year suicidal ideation and (2) firearm access and past-year suicidal ideation. **Results/Conclusion:** Firearm violence perpetration was significantly associated with greater odds of suicidal ideation (OR= 1.46; 95% confidence interval: 1.02, 2.01). Firearm access was also significantly associated with greater odds of suicidal ideation (OR= 1.46; 95% confidence interval: 1.09, 1.96). These results suggest that firearm perpetration is a marker for suicide risk and may be useful as part of mental health screening for YAEH, particularly in certain systems (e.g., correctional systems). These findings also underscore the importance of firearm screening with YAEH, but this demands reconsideration of many routine strategies for reducing firearm access because such strategies were not designed for unique homelessness contexts. **Innovation & Significance to Field:** This is the first known work to examine the link between firearm violence and access and suicidal ideation among YAEH. As such, it provides a critical foundation for future research and prevention strategies

that seek to tackle firearm-related suicide in this underserved and high-risk population.

5. Predicting beliefs about firearms in the home and suicide risk across ecological levels

Dan Lee PhD¹, Leigh Rauk PhD¹, Megan Simmons PhD, MPH², Marc A. Zimmerman PhD¹, Patrick M. Carter MD¹

¹University of Michigan Institute for Firearm Injury Prevention, ²Missouri Foundation for Health

Statement of Purpose: We studied individual, family, and community level factors that are associated with beliefs that having a firearm in the home increases risk of suicide. **Methods/Approach:** The Missouri Firearm Survey is a cross-sectional, web-based survey (7/2020-8/2020) of 1,045 adult Missourians regarding firearm-related practices and beliefs. We conducted a hierarchical linear regression analysis to assess the relationship between factors across ecological levels and beliefs about firearms and suicide risk. **Results/Conclusion:** Final regression model results indicate that individual level factors including identifying as male ($b = 0.23$, $p < .01$), higher education ($b = 0.08$, $p < .001$), being a gun owner ($b = -0.22$, $p < .05$), having formal firearms training ($b = -0.37$, $p < .001$), and having suicide training ($b = -0.28$, $p < .05$) as significant predictors of beliefs about firearms in the home increasing suicide risk. A family level factor of currently having a gun in the home ($b = -0.24$, $p < .05$) was also found to be a significant predictor of individual's beliefs about firearms in the home increasing risk of suicide. Community level factors of fear of community violence victimization ($b = -0.10$, $p < .001$) and living in urban ($b = 0.35$, $p < .001$) and rural ($b = -0.23$, $p < .01$) communities were also significant predictors of individual's beliefs that a firearm in the home increases risk of suicide. **Innovation & Significance to Field:** Those in higher risk categories including gun owners and those living in gun households were less likely to believe guns in the home increase suicide risk. Given that firearms are a uniquely lethal method of suicide and rates of suicide in the state of Missouri have grown faster than the national average, results may help to identify areas of potential intervention at the individual, family, and community levels.

6. Risk Perception and Temporary Storage Options in Texas: Opportunities for Intervention

Sandra McKay MD FAAP¹, Zoabe Hafeez MD¹, Liam Murphy MS², Mike Henson-Garcia MPH³

¹Department of Pediatrics, McGovern Medical School at the University of Texas Health Science Center at Houston (UTHealth) and Children's Memorial Hermann Hospital, ²McGovern Medical School at the University of Texas Health Science Center at Houston, ³Department of Health Promotion and Behavioral Sciences, School of Public Health, The University of Texas Health Science Center

Statement of Purpose: The purpose of this study was to evaluate how the risk perceptions of firearm owning parents compared to the community-level prevalence of pediatric firearm injuries in the Greater Houston Area and to determine, geospatially, the availability of temporary storage options across the area. **Methods/Approach:** Surveys were distributed to parents presenting to a general pediatric clinic in 2021. Gun violence prevalence was estimated from abstracted medical record data obtained from a large hospital in Houston, Texas between 2019-2021. Firearm retailers were contacted using public use data and asked if they offer temporary storage solutions to patrons. We used Fisher's exact test to assess the association between community levels of gun violence and safe firearm storage practices among parents. Messages shared the same image and text on safe firearm storage, but varied in messenger occupation (primary care physician, security forces, combat controller), the presence of text validating the perspective of firearm owners, and the presence of text validating the drive for home protection. We assessed for changes in willingness to utilize four at-home (unloaded, separate from ammunition, in a locked location, with a locking device) and three away-from-home (with family or friend, at a firearm retailer, at a law enforcement agency) firearm storage practices. **Results/Conclusion:** Thirty three out of 128 participants (26%) reported gun ownership with 19% of owners engaging in unsafe storage practices. Further, 105 instances of pediatric gun violence occurred across 67 ZIP codes in Houston, Texas between 2019 to 2021 (Map 1). Most respondents felt gun violence was not prevalent in their community (69%) and did not pose a risk to their children (70%) (Map 2). No association emerged between those who did believe that gun violence is prevalent in the community and those who safely store their firearms at home ($p = 0.5$). Several ZIP codes were identified where prevalence of gun violence was elevated but risk perceptions were low (Map 3). Further, there is a paucity of temporary firearm storage solutions in ZIP codes with high levels of gun violence and elevated perceptions of risk (Map 4). **Innovation & Significance to Field:** There appears to be a mismatch between community-level prevalence of gun violence and gun violence risk perceptions among parents. Practitioners should ensure risk perceptions are

more aligned with prevalence information and use geospatial methods to target areas for future intervention.

7. Development of a Brief, Motivational Interviewing-Based Lethal Means Safety Counseling Intervention Manual for Primary Care Settings

Frances M. Aunon PhD^{1,2}, Joseph Simonett MDi^{3,4}, Steve Martino PhD^{1,2}, Kirsten Wilkins MD^{1,2}, Jeffrey Kravetz MD^{1,2}, Noel Quinn PhD^{1,2}, Jessica Casella¹, Steve K. Dobscha MD^{5,6}, Kristin Mattocks PhD MPH^{7,8}, Suzanne E. Decker PhD^{1,2}

¹VA Connecticut Health Care System, West Haven, CT, ²Department of Psychiatry, Yale School of Medicine, New Haven, CT, ³VA Rocky Mountain Mental Illness Research, Education and Clinical Center for Suicide Prevention, Aurora, CO, ⁴Division of Hospital Medicine, University of Colorado School of Medicine, Aurora, CO, ⁵Oregon Health & Science University, Portland, OR, ⁶VA HSR&D Center to Improve Veteran Involvement in Care, Portland, OR, ⁷VA Central Western Massachusetts Healthcare System, Leeds, MA, ⁸University of Massachusetts Medical School, Worcester, MA

Statement of Purpose: Firearm injury accounts for 69% of veteran suicide deaths.¹ While most veterans suicide decedents were seen in primary care (PC) in the month before death, most did not receive lethal means safety counseling (LMSC).^{2,3} Motivational Interviewing (MI) is an evidence-based approach to facilitate behavior change during brief clinical interactions and is more effective than making brief clinical recommendations.⁴⁻⁹ However, MI has not been adapted for delivery of LMSC. The aim of this project was to develop a stakeholder-informed manual to facilitate delivery of brief, MI-based LMSC in Veterans Affairs (VA) PC settings. **Methods/Approach:** We conducted semi-structured interviews with 30 PC providers and clinical stakeholders (e.g., leadership, nurses, suicide prevention coordinators) from three New England VA settings. The semi-structured interview guide focused on perceptions and experiences with LMSC and challenges in implementation, the support and training required to deliver LMSC, and experience and confidence with MI as a clinical skill. Interviews lasted 30 minutes and were audio-recorded and transcribed. Rapid content analysis¹⁰ was used to analyze data and extract themes. **Results/Conclusion:** Stakeholders felt highly motivated and committed to providing LMSC but suggested more practice and structure for delivering it might increase confidence. They stressed the importance of an MI-based intervention being brief, and stated that sample language, role play scenarios, and a tangible tool (e.g., print card) could support their LMSC and incorporation of MI strategies. **Innovation & Significance to Field:** To our knowledge, this is the first MI manual specifically developed to motivate behavior change during LMSC.

Session 2: Advancing prevention in healthcare settings: data quality and interventions

Capital Room, November 30, 10:15 - 11:45 AM

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1. Classification of Firearm Injury Intent by Trauma Registrars: A Survey with Randomized Case Scenarios

Ali Rowhani-Rahbar MD MPH PhD¹, Deborah Azrael PhD², Catherine Barber MPA², Eric Goralnick MD MS³, Erin MacPhaul MS³, Ravali Yenduri MPH³, Li Zhou PhD³, Andrew Bowen BS⁴, Steve Mooney MS PhD¹, Matthew Miller MD MPH ScD^{2,5}

¹Department of Epidemiology, University of Washington, ²Harvard Injury Control Research Center, Harvard T.H. Chan School of Public Health, ³Brigham and Women's Hospital, ⁴Firearm Injury & Policy Research Program, University of Washington, ⁵Department of Health Sciences, Northeastern University

Statement of Purpose: To examine how trauma registrars code firearm injury intent when the medical record lacks direct attestation of intent, contains only limited circumstantial information, or when credibly contradictory intent-related information is present. **Methods/Approach:** We conducted a national survey of trauma registrars (n=914) in collaboration with the American College of Surgeons Trauma Quality Programs. Registrars were randomized to review a single variant of 18 firearm injury case scenarios and to assign injury intent to each. Variants differed only by the presence or absence of phrases that plausibly affected the likelihood that a case was one intent vs. another. For example, a single case scenario might vary with respect to the number of gunshot wounds sustained by the victim, the number of victims who were shot, or by notation that the victim had a history of previous suicide attempts. **Results/Conclusion:** There were notable differences in the intent assigned by the registrars based on which variant they viewed. For example, the phrase "with reported multiple gunshot wounds" led to a 26% increase in the proportion of registrars who classified one of the cases as assault. Similarly, the phrase "another individual was also shot at the scene" led to a 39% increase in the proportion of registrars who classified another case as assault. While only 20% of registrars classified one of the cases as self-harm in the presence of "history of previous suicide attempts," 38% did so when the word "forehead" as the anatomical location of injury was added to the description of that case. **Innovation & Significance to Field:** Empirically investigating how trauma registrars code firearm injury intent can identify unwanted variations in coding practices and systematic biases in intent attribution. As such, our study can inform the development of targeted coding guidance to improve systematic coding of firearm injury intent by trauma registrars.

2. Firearm violence among young adults presenting to the emergency department: initial validation and improvement of the SaFETy score

Jason E. Goldstick PhD¹, Amanda Ballesteros MPH¹, Lauren Whiteside MD², M. Kit Delgado MD³, Patrick M. Carter MD^{1,4}, Rebecca M. Cunningham MD⁵

¹University of Michigan, Injury Prevention Center, ²University of Washington, Department of Emergency Medicine, ³University of Pennsylvania, Department of Emergency Medicine, Department of Epidemiology and Biostatistics, ⁴University of Michigan, Institute for Firearm Injury Prevention, ⁵University of Michigan, Department of Emergency Medicine, Office of the Vice President for Research

Statement of Purpose: The SaFETy score is a 4-item, 10-point clinical screening tool for firearm violence risk. We are currently conducting a multisite prospective longitudinal study to validate and improve the score. Using partial baseline data, we examine cross-sectional associations between the SaFETy score and firearm violence involvement, and investigate its improvement in this new sample. **Methods/Approach:** Staff recruited participants aged 18-24 from four emergency departments in three cities (Flint, Seattle, Philadelphia). Participants completed a comprehensive baseline assessment containing validated measurements of violence behaviors, and candidate predictors from domains including: peer behaviors/influences, peer/parental support, familial environment, adverse childhood experiences, neighborhood-level factors, violence exposures/attitudes, substance use, mental health symptoms, anger management, impulsivity, prosocial involvement, and resiliency/coping. We calculated the SaFETy

score and examined its distribution and association with past-six-month firearm violence at baseline. We then mined the new candidate set using elastic-net-penalized logistic regression to identify factors associated with baseline firearm violence/threats. **Results/Conclusion:** There are 815 (out of planned N=1,500) currently enrolled across four sites (41.1% Black, 32.5% White, 9.6% Multi-racial, 14.6% Other race; 36.3% male, 59.9% female, 3.8% non-conforming). Among those, 49 (6.0%) report past-six-month firearm violence (victim or aggressor). Those with low (Score=0; 57.6%), moderate (Score=1-5; 36.9%), and high (Score=6+; 5.5%) SaFETy scores had firearm violence rates of 0.4%, 10.3%, and 34.9%, respectively. The AUC relating the score with firearm violence was 0.89 (95%CI: 0.85-0.94). Including firearm threats (excluded above due to endogeneity with the SaFETy score), 124 (15.2%) reported firearm violence at baseline; subsequent data mining identified important predictors not available in the data used to derive the original score, including ACEs, impulsivity, anger management, and more detailed peer/parental/community context measures. **Innovation & Significance to Field:** Initial results suggest strong external validity for the SaFETy score and suggest directions for improvement. Effective firearm violence screening tools are critical to optimally allocating prevention resources.

3. A Review of Hospital-Based Violence Intervention Programs and Evidence of their Effects on Risk of Future Violence

Daniel Webster ScD MPH¹, Joseph Richardson Jr. PhD², Christopher St. Vil PhD³, Nicholas Meyerson MS¹, Rachel Topazian¹

¹Center for Gun Violence Solutions, Johns Hopkins Bloomberg School of Public Health, ²Department of African American Studies, University of Maryland, College Park, ³Department of Social Work, University of Buffalo

Statement of Purpose: Survivors of shootings and stabbings are at increased risk of future involvement in violence. There is growing investment in Hospital-based Violence Intervention Programs (HVIPs) intended to lower this risk, yet research is limited. We critiqued and synthesized published research on the design of HVIPs and their effects on risks of future violence. **Methods/Approach:** We searched Scopus, Web of Science, and PubMed for studies to identify studies of HVIPs that assessed future victimization or perpetration of violence as outcomes and had a control group. We used a modified Cochrane review for study bias. **Results/Conclusion:** Most HVIPs studied involved enhanced engagement and case management and referrals. None explicitly mentioned ties to community violence interruption (CVI) programs and few noted specific behavior change methods. Two of six randomized controlled trials (RCTs) examining repeat hospital treatment for injuries from violence found beneficial effects. Two of four RCTs examining subsequent offending found favorable treatment effects. Findings for quasi-experimental and studies with historical controls were mixed. Selection bias plagued nearly all studies and data on individuals who declined HVIP services were rarely included. Future research should use study designs and analytic methods that minimize selection bias and should examine HVIP participation and dropout. Mixed methods would deepen our understanding of program effects and survivors' needs. HVIPs could be strengthened with partnerships with CVI programs and adoption of evidence-based behavior change methods. **Innovation & Significance to Field:** Recommendations were generated for improved program outcomes based on the evidence from HVIP research and the broader study of violence prevention. The paper should stimulate new research and programming.

4. HBVIPs (Hospital Based Violence Intervention Programs): Views from the Worker Perspective

Christopher St. Vil PhD¹, Nathan Aguilar LCSW², Meredith Njus³, Erin Hall MD⁴

¹University at Buffalo School of Social Work, ²Columbia University, NY, ³Michigan State University/Ascension Providence Hospital, ⁴Georgetown University School of Medicine

Statement of Purpose: Hospital-based violence intervention programs have been evaluated quantitatively. However, few studies have explored them qualitatively through the voice of program staff. The purpose of this study was to explore the views and perceptions of HBVIP workers in regard to working with victims of violent injury and the overall impact of the program. **Methods/Approach:** Interviews for this study were part of a larger pilot study that explored the impact of HBVIPs on trauma recidivism. Interviews were conducted with 7 staff from two HBVIPs housed in two different level 1 trauma centers in an east coast city. The interview schedule covered topics such as factors that contributed to the uptake of services among male victims, what success looks like to them, and how male victims, especially those with gunshot wounds, benefit from the program. Interviews were

audio-recorded and transcribed verbatim; open coding followed by deductive analysis by three coders was used to generate themes from the transcripts. **Results/Conclusion:** Worker responses were categorized into six themes: (1) perceived mission of the program and their role, (2) challenges to service uptake among male victims of violence, (3) patient needs, (4) factors that contribute to service uptake, (5) the role of family in the program and (6) what success looks like for the victims they work with. **Innovation & Significance to Field:** Conclusions from the interviews with the HBVIP workers suggest that (1) the nature of HBVIPs are micro in nature and they are not likely to have an impact on macro level rates of violence and (2) from the perception of the worker the main benefit to male victims is the expansion of their worldview or insight. Implications for shifting the perspective of what outcomes HBVIPs should be understood as targeting are discussed.

5. Mental Health Service Use after Pediatric Nonfatal Firearm Injuries

Jennifer A. Hoffmann MD¹, Christian D. Pulcini MD MEd MPH², Matt Hall PhD³, Joel A. Fein MD MPH⁴, Sofia Chaudhary MD⁵, Peter F. Ehrlich MD MSc⁶, Eric W. Fleegler MD MPH⁷, Kristyn N. Jeffries MD⁸, Monika K. Goyal MD MSCE⁹, Stephen Hargarten MD MPH¹⁰, Elizabeth R. Alpern MD MSCE¹, Bonnie T. Zima MD MPH¹¹

¹Division of Emergency Medicine, Ann & Robert H. Lurie Children's Hospital of Chicago, Northwestern University Feinberg School of Medicine, Chicago, IL, ²University of Vermont Medical Center and Children's Hospital, Larner College of Medicine at the University of Vermont, Burlington, VT, USA, ³Children's Hospital Association, Lenexa, KS, USA, ⁴Children's Hospital of Philadelphia, University of Pennsylvania, Philadelphia, PA, USA, ⁵Children's Healthcare of Atlanta, Emory University School of Medicine, Atlanta, GA, USA, ⁶University of Michigan Ann Arbor, Michigan, USA, ⁷Harvard Medical School; Division of Emergency Medicine, Boston Children's Hospital, Boston, MA, USA, ⁸Children's Mercy Hospitals, Kansas City, MO, USA, ⁹Children's National Hospital, George Washington University, Washington, DC, USA, ¹⁰Medical College of Wisconsin, Milwaukee, WI, USA, ¹¹University of California at Los Angeles, Los Angeles, CA, USA

Statement of Purpose: Children who survive firearm injuries may be at risk for mental health (MH) sequelae. Our objective was to examine sociodemographic and clinical characteristics associated with MH service use after a nonfatal firearm injury among Medicaid-enrolled children. **Methods/Approach:** We retrospectively studied children 5-17 years with nonfatal firearm injuries from 2010-2018 in the Medicaid MarketScan claims database. We used regression analyses to examine sociodemographic and clinical characteristics associated with MH service use in the 6 months after injury. We stratified analyses by MH service use in the 6 months before injury (i.e., ongoing versus new MH service use). **Results/Conclusion:** Among 2613 children with a nonfatal firearm injury, 958 (36.7%) used any MH services in the 6 months after injury, and, of these, 378 (39.5%) had new MH service use. The most frequent new MH diagnoses were substance-related and addictive disorders and trauma and stressor-related disorders. The odds of MH service use after injury were lower among Black children (aOR 0.77, 95% CI 0.61, 0.98) compared to White children and higher among children with prior MH service use (aOR 10.72, 95% CI 8.69, 13.22). Among children without prior MH service use, the odds of MH service use after injury were higher among children with a new MH diagnosis during the index firearm encounter (aOR 3.45, 95% CI 2.44, 4.88) and among children with a new complex chronic condition after firearm injury (1.77, 95% CI 1.19, 2.64). **Innovation & Significance to Field:** This is the first investigation that describes MH service utilization after a nonfatal firearm injury in a large, publicly-insured sample of children. The findings suggest a need to prioritize access to MH services for children who are Black and who have no prior MH service contact. Detection of new MH diagnoses during a firearm injury encounter may facilitate connection to subsequent MH services.

6. Predictors of recent mental health service utilization among firearm owning service members with high levels of psychological distress

Taylor R. Rodriguez MS^{1,2}, Shelby L. Bandel MS^{1,2}, Allison E. Bond MA^{1,2}, Michael D. Anestis PhD^{1,3}, Joye C. Anestis PhD⁴

¹The New Jersey Gun Violence Research Center, Rutgers University, ²Department of Psychology, School of Arts & Sciences, Rutgers University, ³Department of Urban Global Public Health, School of Public Health, Rutgers University, ⁴Department of Health Behavior, Society, & Policy, School of Public Health, Rutgers University

Statement of Purpose: Many firearm-owning service members, and particularly those with an elevated risk of

suicide, store firearms unsafely, increasing the risk of suicide death (Anestis et al., 2020). Furthermore, many individuals who die by suicide with a firearm do not seek mental healthcare (Anestis & Green, 2015). In order to identify barriers to treatment seeking, the current study explores predictors of recent treatment utilization (i.e., last three months) among firearm owning service members with high levels of distress. **Methods/Approach:** The sample included 268 service members with clinically elevated scores on the PCL-5 (69.2% White, 44% Hispanic, 75.6% Male). A two-step logistic regression was conducted with sociodemographic variables in Step 1 (e.g., gender, race, age, active duty) and suicide-related variables in Step 2 (e.g., ideation, behaviors, wish to die). **Results/Conclusion:** The following identities were associated with an increased likelihood for treatment utilization: male, older, racial group other than Black or White, and never active duty. Additionally, those with past year suicidal behaviors and higher levels of past week hopelessness were more likely to have been in treatment compared to those without suicidal behaviors or with lower hopelessness scores. **Innovation & Significance to Field:** Unexpectedly, those with an increased risk of suicide were more likely to be in treatment. Other results demonstrate demographic differences in treatment utilization that were contrary to literature (e.g., males and racial minorities oftentimes seek treatment less). Our unique sample of mostly White and male firearm owning service members may be driving these contrary results. Overall, results suggest that the service members in distress who have access to firearms are connected to mental healthcare. As such, increased firearm safety efforts (e.g., lethal means counseling) in mental healthcare may be a useful avenue for preventing firearm suicide deaths.

7. Longitudinal Healthcare Utilization and Expenditures of Children Before and After Firearm Injury

Christian Pulcini MD MEd MPH¹, Monika K. Goyal MD MSCE², Matt Hall PhD³, Heidi G. De Souza MPH³, Sofia Chaudhary MD⁴, Elizabeth R. Alpern MD MSCE⁵, Joel A. Fein MD MPH⁶, Eric W. Fleegler MD MPH⁷

¹Department of Surgery & Pediatrics, University of Vermont Medical Center and Children's Hospital, Lamar College of Medicine at the University of Vermont, Burlington, VT, USA, ²Department of Pediatrics, Children's National Hospital, George Washington University, Washington, DC, USA, ³Children's Hospital Association, Lenexa, KS, USA, ⁴Department of Pediatrics and Emergency Medicine, Children's Healthcare of Atlanta, Emory University School of Medicine, Atlanta, GA, USA, ⁵Department of Pediatrics, Ann & Robert H. Lurie Children's Hospital of Chicago, Northwestern University Feinberg School of Medicine, Chicago, IL, USA, ⁶Department of Pediatrics, Children's Hospital of Philadelphia, University of Pennsylvania, Philadelphia, PA, USA, ⁷Departments of Pediatrics and Emergency Medicine, Harvard Medical School; Division of Emergency Medicine, Boston Children's Hospital, Boston, MA, USA

Statement of Purpose: Firearm injuries are one of the leading causes of morbidity and mortality among children. Further, for those who survive, firearm injuries are a source of significant toxic stress. Limited information exists about the impact of non-fatal firearm injuries on healthcare utilization and expenditures. Our objective was to compare healthcare encounters and expenditures one year before and up to two years following a non-fatal firearm injury, with a specific focus on mental health. **Methods/Approach:** We performed a retrospective cohort study of children 0-18 years with ICD-9/ICD-10 diagnosis codes for firearm injury from 2010-2016 in the Medicaid MarketScan claims database. Outcomes included differences in healthcare encounters and expenditures for one year before and two years after the injury, including mental health. Descriptive statistics characterized patient demographics and healthcare utilization. Health expenditures were evaluated with Wilcoxon Sign Rank Tests. **Results/Conclusion:** Among 911 children, there were 12,757 total healthcare encounters the year prior to the index firearm injury, 15,548 one-year after ($p<0.001$), and 10,228 total encounters in the second year ($p<0.001$). Concomitantly, there was an overall increase of \$14.4 million in health expenditures one year after ($p<0.001$), and a \$0.8 million decrease two years after the firearm injury ($p=0.001$). There was a 31% and 37% absolute decrease in mental health utilization and expenditures respectively two years after the firearm injury ($p<0.001$). Children who experience non-fatal firearm injury have an increased number of healthcare encounters and healthcare expenditures the year after firearm injury, which is not sustained for a second year. Mental health utilization and expenditures decrease after a firearm injury. **Innovation & Significance to Field:** This is the first and largest investigation of healthcare utilization and expenditures among children after a non-fatal firearm injury. Further, this is the first investigation that describes mental health utilization and expenditures in a large, publicly-insured sample of children.

Session 3: Firearm homicides & cities: Exploring community perspectives, neighborhood characteristics, and violence prevention programs

Congressional Room, November 30, 1:15 - 2:45 PM

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1. Empowerment and Redemption: A qualitative study about Cure Violence outreach and mentoring

Peter Simonsson PhD MSW LCSW¹, Caterina Roman PhD², Shadd Maruna PhD³

¹Lewis Katz School of Medicine at Temple University, ²Department of Criminal Justice, Temple University,

³Department of Sociology and Social Work, Queens University Belfast

Statement of Purpose: Peer mentoring programs often use so-called “credible messengers” or “experts by experience” to support individuals in early desistance to break away from street life and violence. Credible messengers are individuals who themselves are in later stages of desistance from crime, and mentoring is an intrinsic part of their new identities. Peer mentors often operate independently of law enforcement and can more easily gain trust in marginalized inner-city communities impacted by violence. Research exploring how peer mentoring can support desistance is scarce. Furthermore, it is unclear how credible messengers use their own “street background” to promote desistance among people engaged in violent crime. This study explored how credible messengers, with sustained desistance, used their own narratives and identity shifts to mentor and promote desistance among high-risk youth and young adults. **Methods/Approach:** This study employed a narrative framework. We interviewed 40 young people at-risk who expressed a desire to desist from crime, and 12 credible messengers with sustained desistance. Thematic analysis was used to examine (1) the strategies used by credible messengers to promote desistance among young people at risk, and (2) how young people at risk used peer mentoring as leverage to leave street life. **Results/Conclusion:** The comparison of narrative interviews with peer mentors and those with mentees identified several common themes around redemption, empowerment and caring responsibilities, suggesting mentees have identified with and adopted several of the key messages of the mentors. In short, mentees’ nascent desistance scripts reflected closely the established self-narratives of their mentors. **Innovation & Significance to Field:** This thematic analysis suggests peer mentors may have a distinct (and probably unique) proficiency in impacting the narratives utilized to make sense of their chaotic lives. These advantages likely could be leveraged to extend the types of support that peer mentors offer.

2. Augmented synthetic control methods demonstrate overall effectiveness of a Cure Violence intervention in Baltimore City, Maryland

Carla Tilchin MSPH^{1,2}, Mitchell Doucette PhD MS², Daniel Webster ScD MPH²

¹Department of Health, Behavior, and Society, Johns Hopkins Bloomberg School of Public Health, ²Center for Gun Violence Solutions, Johns Hopkins Bloomberg School of Public Health

Statement of Purpose: Baltimore continues to be plagued by gun violence with over 300 homicides recorded every year since 2015. Safe Streets Baltimore (SSB) is a community-based intervention modeled off *Cure Violence* that employs individuals from their communities to build relationships with high risk individuals, mediate conflicts before they escalate to violence, and promote nonviolent social norms. The objective was to evaluate site specific and overall effects of SSB, including six new sites, from January 2007-April 2022. **Methods/Approach:** Point locations of homicide and non-fatal shootings (HNFS) were aggregated to the police post, the same geospatial boundary as SSB sites. Augmented synthetic control models were used to assess the impact of each SSB site on monthly HNFS. SSB sites were compared to a synthetic version of the site created from a weighted average of a subset of non-SSB posts in the top 30th percentile of HNFS across the study period. Covariates included drug and weapon arrests, major redevelopments, and targeted law enforcement interventions. Random effects meta-analysis was used to assess the average effect of SSB across all sites. **Results/Conclusion:** SSB demonstrated a significant 20% average reduction in HNFS across all sites (95% Confidence Interval: -33%, -1%). Two of eleven sites, both implemented 2020-2021, showed large significant reductions in HNFS (-51% and -47%). All other sites showed non-significant effects, with seven of the remaining nine sites trended towards HNFS reduction. Two of the longer

running sites implemented in 2013 and 2016 had large negative point estimates of -40% and -27%, respectively. **Innovation & Significance to Field:** This is the first evaluation of six new sites and the first to use ASCM which showed smaller prediction error compared to synthetic control models and regression analyses. Overall, SSB showed significant reductions in HNFS. Varying site effectiveness warrants future research into site specific differences in program implementation, law enforcement activities, and patterns of violence.

3. Community-Based Violence Prevention: Unpacking the Newark Community Street Team's High Risk Intervention Program

Daamin X. Durden¹

¹*Executive Director of the Newark Community Street Team*

Statement of Purpose: The High Risk Interventionist (HRI) team connects those engaged in violence to supportive counseling, crisis intervention assessment, mediation, referrals, and resource information in order to restore peace and avoid arrest and incarceration. **Methods/Approach:** NCST's high-risk interventionists identify or receive referrals for potential participants who are engaged in active disputes with other members of the community and engage them in intensive and culturally appropriate discussions to create a pathway to de-escalation and mediation. When the timing is appropriate, the NCST High-Risk Interventionist will refer the participant to a Case Manager who is also a mentor. The Case Manager will help their client complete a 6-month life-plan, enroll them in life-skills training sessions and connect them to services needed for a lifestyle transformation. The Case Manager will maintain communication and coordination with the High-Risk Interventionists. NCST Case Managers conduct home visits, travel with participants to job interviews and social service appointments, as well as engage them in extra-curricular activities. **Results/Conclusion:** Since February 2017, the High Risk Interventionist team completed 1638 cases. Based on survey results, residents reported feeling safer as a result of NCST's High Risk Intervention program. Additionally, law enforcement attributes NCST with contributing to violence reduction in areas where they work. **Innovation & Significance to Field:** NCST's violence interruption work provides evidence that public safety can be shaped by community-informed and comprehensive interventions to support individuals who are at greatest risk of victimization. Attendees will learn more about the High Risk Intervention program from one of the NCST's members who has helped to reduce the homicide rate in Newark, New Jersey.

4. Community Perspectives on Firearm Violence in Four Major US Cities

Dionne Barnes-Proby DrPA MSW¹, Paige E. Vaughn PhD², Alexandra Mendoza-Graf PhD¹, Priscillia Hunt PhD¹

¹*RAND Corporation*, ²*Yale Law School*

Statement of Purpose: Firearm violence is associated with psychological, social, and economic damages, and specific communities experience relatively higher rates of firearm violence. However, considerable ambiguity remains about the factors driving rates of firearm violence in those communities. The aim of this study is to improve understanding of the contextual (socio-environmental and physical environment) factors that contribute to or prevent firearm violence within communities of relatively greater firearm violence. **Methods/Approach:** To do this, we collected qualitative data regarding perceptions of contextual factors influencing firearm violence across eight high-risk areas in four U.S. cities (Detroit, Los Angeles, New Orleans, and Pittsburgh). The study neighborhoods were identified using a density-based clustering algorithm with geocoded, publicly available firearm violence and contextual data. We then conducted 5-6 focus groups with residents (n=132) in those neighborhoods, and used an iterative thematic approach to analyze responses. Findings suggest a number of factors were identified in all neighborhoods (e.g., vacant lots, abandoned buildings, limited social resources), while some differed. Finally, we conducted expert interviews with urban planners to identify strategies to address neighborhood concerns. **Results/Conclusion:** This study makes three major contributions to the literature. First, to address the dearth of qualitative research on built and social environment factors and firearm violence we bring together unique qualitative data to supplement existing research, and introducing new factors not yet discussed in the literature. Second, research on the spatial distribution of firearm violence typically studies one city. Using a systematic approach across jurisdictions, our study gains perceptions from people living in different, high crime neighborhoods. Third, this study includes perceptions of the community and urban planners which are often excluded from research in this area. **Innovation & Significance to Field:** Ultimately, the study provides testable insights into why certain built

environment features may or may not influence firearm violence, as well as potential community-level strategies to address firearm violence.

5. Individual, family, and community factors of gun violence affecting California communities

Ninez Ponce PhD MPP^{1,2,3}, Michael Rodriguez MD MPH⁴, Marian Betz MD MPH^{5,6}, Kerith Conron ScD MPH⁷, George E. Tita PhD⁸, Joan Asarnow PhD ABPP^{9,10}, AJ Scheitler, EdD¹

¹UCLA Center for Health Policy Research, ²California Health Interview Survey, ³UCLA Fielding School of Public Health, ⁴Department of Family Medicine, David Geffen School of Medicine at UCLA, ⁵University of Colorado School of Medicine, ⁶Eastern Colorado Veterans Health Administration, ⁷Charles R. Williams Institute on Sexual Orientation Law and Public Policy at UCLA School of Law, ⁸UC Irvine Livable Cities Lab, ⁹UCLA Psychiatry and Biobehavioral Sciences, ¹⁰SAMHSA-Funded Center for Trauma-Informed Suicide, Self-Harm, and Substance Abuse Treatment and Prevention

Statement of Purpose: Research on subpopulations is lacking to fully understand the complex issue of gun violence. We aim to improve the understanding of the socioeconomic, demographic, and environmental risk and protective factors associated with gun ownership, firearm storage practices and nonfatal suicidal behavior impacting important subpopulations-- youth and young adults, veterans, immigrants, and LGBT people. This information is being collected by the California Health Interview Survey (CHIS) 2021/2022, the largest state population health survey in the nation. **Methods/Approach:** We conducted an observational study using the CHIS 2021 firearms module to evaluate complex associations and interactions of individual, family, and community factors that condition the association of gun ownership with physical and mental health, suicide ideation, and perceptions of being a victim of gun violence. The CHIS is a cross-sectional dataset of 20,000 randomly selected adult, adolescent, and child household members annually. Firearm-related questions include firearm ownership in households and accessibility of firearms, firearm storage practices, and perceptions regarding gun violence victimization. **Results/Conclusion:** Data will be available in September 2021; study results will identify risk factors among high-risk subpopulations (youth and young adults, veterans, immigrants, and LGBT people) who experience disproportionate rates of dying by suicide and urban violence through the use of a firearm. **Innovation & Significance to Field:** Our research will fill critical data gaps about risk factors for gun suicide, urban gun violence, and fear of firearm victimization. The CHIS data will enable more insights on socio-cultural patterns and intersections of family and neighborhood contexts, along with local policies that may alter gun violence trajectories, helping to inform much-needed policies and programs for high-risk communities. Filling these critical data gaps provides a significant resource to decision makers and community health leaders with evidence to inform effective policies.

6. The Contribution of Neighborhood Characteristics to Psychological Symptom Severity in a Cohort of Injured Black Men

Therese S. Richmond PhD RN FANN^{1,2}, Marta M. Bruce PhD RN^{*1,3}, Andrew J. Robinson BS¹, Douglas Wiebe PhD^{4,5}, Justine Shults PhD^{4,5}

¹University of Pennsylvania School of Nursing, ²Penn Injury Science Center, University of Pennsylvania, Philadelphia, PA, ³Hospital of the University of Pennsylvania, ⁴University of Pennsylvania Perelman School of Medicine, ⁵Department of Biostatistics and Epidemiology, Division of Biostatistics

**Please note Dr. Bruce is first author but will be out of country and Dr. Richmond who is senior author will present unless Dr. Bruce's travel plans change.*

Statement of Purpose: Traumatic injury is not evenly distributed by race and class in the US. Black men are marginalized in society, often reside in disadvantaged neighborhoods, and are at higher risk for injury mortality and ongoing physical and psychological problems following injury. Post-traumatic stress disorder (PTSD) and depressive symptom severity are among several problematic and disabling conditions faced by injury survivors. While much research has examined individual factors that lead to increased post-injury psychological symptom severity, the contribution of the social and physical environment has been relatively understudied. The purpose was to examine the contribution of neighborhood characteristics to PTSD and depressive symptom severity in Black men following traumatic injury. **Methods/Approach:** Prospective cohort study. Participant data were linked via GIS to neighborhood characteristics (constructs established by factor analysis) to spatially model factors associated with

increased post-injury psychological symptom severity using a GEE regression analysis, adjusting for injury mechanism and severity, age, and insurance. **Results/Conclusion:** 451 adult Black males hospitalized for traumatic injury. The 451 study participants lived in 270 census block groups. Greater than half of the men (53%) had intentional injuries (e.g., gunshot wound, stabbing, assault), and 42% reported having no health insurance. The 4 constructs were neighborhood disconnectedness; concentrated disadvantage/deprivation; crime/violence/vacancy; and race/ethnicity. High depressive and PTSD symptom severity was reported by 36.8% and 30.4% of participants, respectively. Higher PTSD symptom severity was associated with crime/violence/vacancy, and higher depressive symptom severity was associated with neighborhood disconnectedness. PTSD and depressive symptom severity were associated with intentional injury mechanisms and Medicaid/no insurance. Higher injury severity was associated with depressive symptoms. **Innovation & Significance to Field:** This study provides an initial step in broadening the scope of research to look beyond individual factors and examine social and structural factors that impact post-injury mental health for marginalized groups.

7. Participatory Action Research to Understand Gun-Related Attitudes, Behaviors, and Practices

Krista R. Mehari PhD¹, Phillip N. Smith PhD¹, Jasmine N. Coleman PhD¹, L. Taylor Stevens MS¹, Hyun Kim MS¹, Albert D. Farrell PhD²

¹*Department of Psychology, University of South Alabama*, ²*Department of Psychology & Clark-Hill Institute for Positive Youth Development, Virginia Commonwealth University*

Statement of Purpose: The purpose of this participatory action research was to understand social-ecological factors that underlie gun-related attitudes, behaviors, and practices among two populations at high risk for intentional gun injury: gun owners (suicide) and people living in areas with high rates of violence (homicide/assault). **Methods/Approach:** Qualitative data collection and analysis using a grounded theory approach is ongoing. Participants are 107 individuals between the ages of 14 and 78 ($M = 41$; $SD = 17$) who are either gun owners or people living in areas of high rates of violence (anticipated $N = 210$). Participants engaged in interviews about their gun-related experiences, attitudes, behaviors, and practices. **Results/Conclusion:** Multiple categories emerged including general attitudes about guns, reasons for ownership, carrying practices, reasons for carrying, storage practices, reasons for storage practices, and attitudes about injury prevention. To highlight some of these categories, Reasons for Ownership included major themes of *protection*, *recreation*, *hunting*, *sociopolitical reasons*, *work* (legitimate and non-legitimate), and *happenstance*. Multiple Storage Practices emerged, with the most frequent theme being *put it up* (in an out-of-sight location, such as a shelf). Within Motivations for Storage Practices, *putting it up* was supported by the perception that this practice would avoid accidents, but allowed for easy access for protection. Themes related to specific gun-injury prevention strategies varied considerably, with some participants having general positive or negative stances towards gun restrictions, and some participants providing more nuance related to specific strategies' acceptability, feasibility, and likely effectiveness. **Innovation & Significance to Field:** A cross-cutting theme relates to a perception of danger and a need to be able to protect oneself and one's family from external threats. The information emerging from these interviews creates a culturally grounded model for understanding risk for gun-related injury, which is key for designing interventions that are culturally responsive, relevant, and effective.

Session 4: Intimate partner violence: Assessing risk and implementing evidence-based solutions

Capital Room, November 30, 1:15 - 2:45 PM

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1. Implementation and Effectiveness of Firearm Restriction Enforcement in Domestic Violence Protection Orders on Violent Crime

Alice M. Ellyson MS PhD¹, Avanti Adhia ScD², Sandra Shanahan MSW³, Deirdre Bowen JD PhD⁴, Ali Rowhani-Rahbar MD MPH PhD⁵

¹Department of Pediatrics, School of Medicine, University of Washington, ²Department of Child, Family, and Population Health Nursing, School of Nursing, University of Washington, Seattle, WA, ³Regional Domestic Violence Firearm Enforcement Unit, Seattle, WA, ⁴School of Law, Seattle University, Seattle, WA, ⁵Department of Epidemiology, School of Public Health, University of Washington, Seattle, WA

Statement of Purpose: This study examined the robust enforcement of state-level DVPO firearm prohibitions among King County, WA respondents by comparing the perpetration of violent crime before (2014-2016) and after (2018-2020) the implementation of the Regional Domestic Violence Firearms Enforcement Unit. The RDVFEU promotes compliance with firearm prohibitions by reviewing petitions, assessing the quantity and location of firearms/weapons, querying purchase history, following up on leads about firearm access, and documenting, coordinating, and sharing information with the court. **Methods/Approach:** We provided detailed quantitative measurement on the enforcement of Orders to Surrender Firearms and Other Dangerous Weapons (OTSWs) as well as recommendations for ongoing enforcement challenges to complement existing qualitative research. We used a differences-in-differences framework where firearm-possessing respondents (exposed) were compared to respondents who did not possess firearms (control) providing estimates of an intent-to-treat effect because firearm dispossession did not occur in all cases. **Results/Conclusion:** Petitioners declared that the respondent owned or possessed a firearm in 21.4% of granted DVPOs, but petitioners indicated they either did not know, were unsure of, or unwilling to share whether the respondent had access to or owned firearms in a little less than one third (28.4%) of granted DVPOs. The proportion of granted DVPOs with an OTSW when it was mandatory according to state law increased over the study period from 24.7% in 2014 to 84.0% in 2016 to a peak of 95.2% in 2019. Results from analyses using differences-in-differences to examine the role of RDVFEU implementation and the promotion of firearm prohibition compliance on violent crime will be discussed. **Innovation & Significance to Field:** Our findings show about half of respondents in granted DVPO cases either had or could have had access to firearms, demonstrating the need for firearm access verification, safety assessment, firearm information vetting, and processes to safety and effectively promote compliance with DV-related firearm prohibitions.

2. Double jeopardy: Intimate partner and firearm violence among youth and young adults experiencing homelessness

Annah Bender PhD¹, Hsun-Ta Hsu PhD², Robin Petering PhD³, Anamika Barman-Adhikari PhD⁴, Kristin Ferguson PhD⁵, Sarah Narendorf PhD⁶, Jama Shelton PhD⁷, Diane Santa Maria DrPH⁸, Kimberly Bender PhD,⁴

¹School of Social Work, University of Missouri, St Louis, ²School of Social Work, University of Missouri, Columbia, ³Lens, Co, ⁴Graduate School of Social Work, University of Denver, ⁵School of Social Work, Arizona State University, ⁶Graduate College of Social Work, University of Houston, ⁷Silberman School of Social Work, Hunter College, ⁸Cizik School of Nursing, University of Texas Health Science Center at Houston

Statement of Purpose: Intimate partner violence (IPV), defined as physical, sexual, or psychological harm inflicted by an intimate partner, is a main driver of homelessness. Among young adults experiencing homelessness (YAEH), one-quarter report IPV victimization during the previous year. Concurrently, YAEH face a host of additional health and injury risks, including firearm violence exposure (FVE). This study examines the link between IPV and firearm access and exposure. We hope to generate a foundational understanding of risks for violence and injury that may be

unique to this population. **Methods/Approach:** This analysis draws data from a study of 1,426 YAEH across seven U.S. cities who completed computer-assisted questionnaires in 2016-2017 regarding their life experiences, health, and violence involvement. We built two logistic regression models examining the association between IPV (victimization and perpetration) and FVE. Additional covariates included sociodemographics, system involvement, and mental health. **Results/Conclusion:** IPV victimization since becoming homeless was significantly associated with a 40% increase in the likelihood of direct firearm violence victimization. Perpetrating IPV was significantly associated with an 81% increase in the risk of firearm violence perpetration, but was not associated with firearm violence victimization. Female gender, childhood trauma, juvenile justice system involvement, mental health diagnosis, and pregnancy were all significantly associated with increased odds of IPV victimization and perpetration. **Innovation & Significance to Field:** This study illustrates the risks of violence exposure among YAEH. Yet prevention strategies for IPV and FVE often do not take into account the unique burdens posed by homelessness. The dangers of living in shelters or on the street, coupled with a lack of access to resources, further underscore the vulnerability of YAEH to the “double jeopardy” of both IPV and FVE. Research coupled with interventions focusing on reducing the harms associated with these forms of violence among YAEH are urgently needed.

3. Firearm-related threats and violence against minors among granted Domestic Violence Protection Orders in King County, WA

Avanti Adhia ScD¹, Alice M. Ellyson MS PhD², Ayah Mustafa³, Vivian H. Lyons MPH PhD⁴, Sandra Shanahan MSW⁵, Ali Rowhani-Rahbar MD MPH PhD⁶

¹Department of Child, Family, and Population Health Nursing, School of Nursing, University of Washington, ²Department of Pediatrics, School of Medicine, University of Washington, ³Firearm Injury & Policy Research Program, School of Medicine, University of Washington, ⁴Social Development Research Group, School of Social Work, University of Washington, ⁵Regional Domestic Violence Firearm Enforcement Unit, King County, WA, ⁶Department of Epidemiology, School of Public Health, University of Washington

Statement of Purpose: Threats and violence towards children occur in homes with domestic violence (DV), but less is known about how firearms are used in threats or in non-fatal violent acts against children living in homes with DV. Nearly two-thirds of child fatalities occurring in the setting of DV are a consequence of using firearms. Among firearm homicides of children under 13 years of age, 85% occur in the home and nearly one third are related to DV. **Methods/Approach:** We evaluated the use of weapons in threats and violence against minors (children < 18 years) in 3,543 granted DVPO petitions from 2014-2020. We calculated the proportion of DVPO petitions with firearm threats and firearm violence against minors. We examined the prevalence of firearm threats and firearm violence against minors across firearm-possessing and non-firearm possessing respondents. **Results/Conclusion:** Nearly two thirds (62.2%, n=2,202) of granted DVPOs involved a minor (i.e., minor was directly listed as involved or the petition indicated threats or violence against a minor). DV occurred when minors were present in 59.8% of granted DVPO cases involving minors (n=1,316). Nearly a third of cases (31.2%, n=686) included threats against a minor. Of these, 28.1% (n=193) involved any weapon. Among cases with threats that involved a weapon, 39.4% (n=76) involved only a bodily weapon, 45.6% (n=88) only a nongun external weapon, and 15.0% (n=29) a firearm. Almost half (47.7%, n=1,051) of cases included violence against a minor. Of these, 68.7% (n=722) involved any weapon. Among violent cases that involved a weapon, 52.8% (n=381) involved only a bodily weapon (n=381), 45.3% (n=327) only a nongun external weapon, and 1.9% (n=14) a firearm. The proportion of both firearm threats and violence against minors was higher among firearm-possessing respondents. **Innovation & Significance to Field:** Firearm prohibitions are an important part of DVPOs to protect both DV survivors and minors involved.

4. Assessing the Risk for Intimate Partner Homicides – The PAIR Studies

Jesenia M. Pizarro PhD¹, Jill T. Messing PhD MSW², Millan AbiNader PhD LMSW³, April M. Zeoli PhD MPH⁴, Jacquelyn Campbell PhD RN FAAN⁵

¹Arizona State University School of Criminology and Criminal Justice, ²Arizona State University School of Social Work, Director of Office of Gender-Based Violence, ³University of Pennsylvania School of Social Policy and Practice, ⁴University of Michigan Department of Health Management & Policy, School of Public Health, ⁵Johns Hopkins School of Nursing

Statement of Purpose: The Preventing and Assessing Intimate Partner Homicide Risk (PAIR) Studies are a multi-state series of case-control studies funded by Everytown for Gun Safety, The National Collaborative on Gun Violence Research, the National Science Foundation, and the National Institute of Child Health and Human Development. This research focuses on assessing risk for intimate partner homicides across six states: Arizona, Maryland, Missouri, New Jersey, Oregon, and Texas. This paper details the purpose, methodology, partnerships, and ultimate aims of the multistate effort. **Methods/Approach:** The PAIR Studies are an update and replication of Dr. Jacquelyn Campbell's 2003 11-city case-control study that examined the risk factors for femicide. Data sources include case files of IPH from law enforcement and medical examiners, interviews with surviving next-of-kin of homicide victims, and interviews with a sample of domestic violence survivors to examine risk factors for IPH, including the role of firearms in conjunction with policy and contextual factors. The methods of data collection, instrument development, as well as partnership development will be discussed. **Results/Conclusion:** Researchers are gathering this information to provide a comprehensive look at intimate partner homicide across the U.S. and as a mechanism for the development of homicide prevention interventions. This symposium provides an example of a transdisciplinary research effort intending to contribute to the understanding of this crime and design solutions to prevent intimate partner homicide. **Innovation & Significance to Field:** The PAIR Studies address gaps in research by using multiple sources of data, including interviews with next-of-kin of homicide victims. The collection of data from family members of the victims of IPH, representing the "voice" of the victims, and the transdisciplinary methodological approaches employed is especially innovative.

5. The contribution of intimate partner violence to fatal firearm deaths: A comprehensive approach using the National Violent Death Reporting System

Julie M. Kafka PhD MPH^{1,2}, Kathryn (Beth) E. Moracco PhD MPH^{1,2}, Brian W. Pence PhD MPH^{2,3}, Pamela J. Trangenstein PhD MPH^{1,4}, Michael D. Fliss PhD MPS MSW^{2,3}, Luz McNaughton Reyes PhD MPH^{1,2}

¹Health Behavior, University of North Carolina (UNC) at Chapel Hill, ²UNC Injury Prevention Research Center, ³Department of Epidemiology, University of North Carolina - Gillings School of Global Public Health, ⁴Alcohol Research Group (ARG), Emeryville, CA, USA

Statement of Purpose: Intimate partner violence (IPV) is associated with elevated risk for suicidal ideation, firearm-related suicide threats, and firearm homicide. Unfortunately, IPV circumstances are not systematically documented for suicides in US mortality datasets. This prohibits researchers from comprehensively assessing the role of IPV in fatal firearm violence. We sought to enumerate the total contribution of IPV to intentional firearm deaths (homicides, suicides, legal intervention deaths) in the US. **Methods/Approach:** We used a multi-pronged approach to assess IPV circumstances in the National Violent Death Reporting System (NVDRS, 2015-2019). First, we inherited information from the existing NVDRS IPV variable and linked deaths by incident ID. Next, we used novel methods including leveraging textual review of death narratives and deploying a validated supervised machine learning tool to ascertain IPV circumstances for suicides. It was not always possible to differentiate victimization from perpetration; instead, we capture any IPV circumstances (yes/no). We report the total contribution of IPV to firearm fatalities with known circumstances (n= 99,121). **Results/Conclusion:** We found that 11.09% (n=10,995) of fatal firearm violence was connected to IPV. Using conventional methods to identify IPV-related deaths, we found n=4,764 firearm homicides, n=293 legal intervention deaths that used a firearm, and n=1,512 firearm suicides (mostly from homicide-suicides). Using novel methods, we further identified n=4,426 IPV-related firearm suicides that would otherwise have been missed. **Innovation & Significance to Field:** One in nine firearm deaths in the US are connected to IPV. A substantial proportion of IPV-related firearm deaths (>40%) are suicides. These findings have key implications. First, monitoring the contribution of IPV to fatal firearm violence, including suicides, is worthwhile. Second, preventing IPV may be an important way to prevent fatal firearm violence. Finally, existing IPV-related firearm restriction policies should be fully implemented and enforced.

6. An Analysis of Pediatric Fatalities in the Context of Parental Separation, Divorce, and Intimate Partner Violence

Kathryn J. Spearman MSN RN PhD Student¹, Kathleen Russell², Jacquelyn Campbell PhD RN FAAN¹

¹Johns Hopkins School of Nursing, ²Center for Judicial Excellence

Statement of Purpose: Child homicide is the fourth leading cause of pediatric mortality in the US, and firearm fatalities are the leading cause of death of children. Yet, child homicides are understudied. Separation, divorce, and intimate partner violence (IPV) have been established as risk factors for femicides, but have not been systematically studied for child homicides. This study seeks to answer: What are the differences in firearm-related and non-firearm related fatalities among children killed in the context of divorcing or separating parents? **Methods/Approach:** We examine a database of children killed (n=845) in the context of parental separation or divorce in the United States collated from media reports and collected by the Center for Judicial Excellence from 2008-June 2022. Based on the situational context and victim-offender relationship (VOR) provided in media narratives, we examine known lethality risk factors from media narratives and the use of firearms versus other causes of death, and test bivariate associations. **Results/Conclusion:** Data analysis is in progress. Analyses will include descriptive data of situational contexts of firearm and non-firearm homicides of children in the context of parental separation and divorce. In addition to demographic variables, we will also examine a number of situational variables disclosed in media narratives that have not been commonly studied for child homicides including victim-offender relationship, number of homicide victims, other non-homicide/injured victims in the event, perpetrator suicide, prior legal system involvement, child custody disputes, and parental separation/divorce. **Innovation & Significance to Field:** No study to our knowledge has specifically examined children killed in the context of family court involvement and parental separation. This study will add to the evidence of firearm-related homicides of children, and provide additional information about other situational risk factors for child homicides that can be used to guide future intervention and policy work.

7. Firearm Access and Suicide-related Behavior among Domestic Violence Protection Order Respondents

Kimberly Dalve MA^{1,2}, Alice M. Ellyson MS PhD³, Deirdre Bowen JD PhD⁴, Frederick Rivara MD MPH³, Isaac Rhew, MPH PhD⁵, Ali Rowhani-Rahbar MD MPH PhD¹

¹Department of Epidemiology, School of Public Health, University of Washington, ²Firearm Injury and Policy Research Program, Harborview Injury Prevention and Research Center, University of Washington, ³Department of Pediatrics, School of Medicine, University of Washington, ⁴School of Law, Seattle University, Seattle, WA, ⁵Department of Psychiatry and Behavioral Sciences, University of Washington

Statement of Purpose: We sought to understand the prevalence of suicidal ideation and suicide attempts by firearm possession status among respondents of domestic violence protection orders (DVPOs). DVPOs can include the removal of firearms from the respondent; however, preventing respondent suicide is often not considered in DV-related firearm prohibitions. **Methods/Approach:** Using a random sample of granted DVPO petitions (n=3543) in King County, WA, we measured history of suicidal ideation, threats, and attempts by the respondent recorded in the DVPO petition using a rules-based text classification system. We performed Poisson regression to estimate prevalence ratios (PR) comparing these three measures by firearm possession status recorded in the DVPO petition. **Results/Conclusion:** Suicidal ideation/behavior by the respondent was common among granted DVPOs (43.2%; n=1532). Of petitions with any suicidal ideation/behavior, 47.2% (n=723) described ideation expressed as a threat, and 14.2% (n=218) described a past suicide attempt. Firearm possession status was known for 71.7% (n=2540) of granted DVPOs of which 29.9% (n=759) possessed firearms. Among respondents who possessed firearms, 46.6% had a history of suicidal ideation/behavior (n=354); 22.3% had a history of suicidal ideation expressed a threat (n=169); and 5.7% had a history of suicide attempt (n=43). When compared to non-firearm possessing respondents, we did not find a significant difference in history of suicidal ideation (PR: 1.01; 95%CI: 0.92-1.11), suicidal ideation expressed as threats (PR: 1.04; 95% CI: 0.88-1.21), or suicide attempt (PR: 0.77; 95%CI: 0.55-1.07). **Innovation & Significance to Field:** Using unstructured data from granted DVPO petitions, this study found a large proportion of DVPO respondents who possess firearms had a history of suicidal ideation and behavior. History of suicidal ideation and behavior was as likely among respondents who possess firearms as those who do not possess firearms. Reducing access to firearms through DVPOs may prevent injury to both the DV survivor and the respondent.

Session 5: Consequences of firearm violence: Mental health and risks for future violence

Congressional Rooms, November 30, 3:00 - 4:30 PM

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1. Mental Health Consequences Following Firearm and Motor Vehicle Related Injuries: Impacting our Treatment Strategies

Peter F. Ehrlich MD MSc¹, Christian D. Pulcini MD MEd MPH², Heide G. De Souza MPH³, Matt Hall PhD³, Annie Andrews MD⁴, Bonnie T. Zima MD MPH⁵, Joel A. Fein MD MPH⁶, Sofia Chaudhary MD⁷, Jennifer A. Hoffman MD⁸, Eric W. Fleegler MD MPH⁹, Kristyn N. Jeffries MD¹⁰, Monika K. Goyal MD MSCE¹¹, Stephen Hargarten MD MPH¹², Elizabeth R. Alphen MD MSCE⁸

¹University of Michigan, ²University of Vermont Medical Center and Children's Hospital, VT, USA, ³Children's Hospital Association, Lenexa, KS, USA, ⁴Medical College of South Carolina, Charleston, SC, USA, ⁵University of California at Los Angeles, Los Angeles, CA, USA, ⁶Children's Hospital of Philadelphia, Philadelphia, PA, USA, ⁷Children's Healthcare of Atlanta, Atlanta, GA, USA, ⁸Ann & Robert H. Lurie Children's Hospital of Chicago, Northwestern University, Chicago, IL, USA, ⁹Boston Children's Hospital, Boston, MA, USA, ¹⁰Children's Mercy Hospitals, Kansas City, MO, USA, ¹¹Children's National Hospital, Washington, DC, USA, ¹²Medical College of Wisconsin, Milwaukee, WI, USA

Statement of Purpose: Trauma exposure is a well-established risk factor for child mental health concerns. A critical knowledge gap exists regarding mental healthcare following firearm injuries. The purpose of this study is to compare newly detected mental health diagnoses (NMHD) and resources among children and adolescents who receive follow-up care after a firearm injury compared to those who suffer a MVC injury. **Methods/Approach:** Using Medicaid MarketScan claims data (2010-2016) we conducted a longitudinal propensity score retrospective study with one year follow up for children aged 3- 17. Each child with a firearm injury was matched with up to 3 children with a MVC injury using age (in years), sex, and the season in which the injury occurred. Children Injury severity was determined by injury severity score (ISS) and ED disposition (home, admit to floor or ICU). Complex chronic condition (CCC) status was determined by diagnosis and procedure codes through a previously validated scheme that had Medicaid enrollment one year prior to and after the injury date. A multivariable logistic regression model for the primary outcome of acquiring a NMHD diagnosis post injury was used to compare firearm injuries to MVC injuries. Odds ratio (OR) for NMHD post injury was adjusted for race, complex chronic conditions (CCC), and severity of injury. **Results/Conclusion:** A total of 1459 children and adolescents were included in the firearm injury cohort with 3691 included as matched controls in the MVC injury cohort. Compared to children with MVC injuries those with firearm injuries were more likely to be Black (64.7%, 37.0 p<0.001), had higher median ISS (4.0, 1.0 p<0.001), less likely to have a prior CCC (5.2%, 7.8% p=0.001), and less likely to be discharged from the emergency department (ED) (71.7%, 93.4% p<0.001). Children with firearm injuries were more likely to have a NMHD post injury compared to after MVC aOR (1.55 [1.33, 1.80]). Hospital admission/severity of injury increased the odds of a new mental health diagnosis compared to discharged from ED: floor (aOR 1.80 [1.47, 2.22]) and ICU (aOR1.78 [1.22, 2.59]) The increased risk of new mental health diagnoses was driven by increases in substance-related and addictive disorders (aOR 2.077 [1.635, 2.639]) and trauma and stressor-related disorders (aOR 2.071 [1.551, 2.764]) (figure1). **Innovation & Significance to Field:** Children in the year following a firearm injury were 1.5 times more likely to have a new NMHD as compared to a MVC. Trauma center future research is needed to develop strategies to detect and treat for the risk of MH sequela as well as examine the extent of undetected need for MH care among children at risk for exposure to firearm injuries.

2. Mental Health outcomes from direct and indirect exposure to firearm violence: A cohort study of nonfatal shooting survivors and family members

Lauren A. Magee PhD^{1,2}, Matthew C. Aalsma PhD³, J. Dennis Fortenberry MD MS⁴, Sami Gharbi MS⁵, Sara E. Wiehe MD MPH⁵

¹O'Neill School of Public and Environmental Affairs, ²Indiana University Purdue University Indianapolis, ³Adolescent

Statement of Purpose: Firearm violence is a public health crisis in the United States. Beyond the survivor, firearm violence impacts family members and communities. Despite the known health inequities that exist among nonfatal shooting survivors, little research has focused on the mental health needs of family members. The objective of this study is to examine mental health prevalence rates of survivors and family members of nonfatal firearm violence. **Methods/Approach:** Police and Medicaid claims data were linked at the individual level between January 1, 2007 and December 31, 2016 in Indianapolis, Indiana. The Medicaid case number was used to identify nonfatal shooting family members. Differences in mental health prevalence and clinical care utilization were examined in the 12-months preceding and following an index nonfatal shooting for survivors, family members and compared to the Medicaid population. Results were stratified by age group (youth and adult). **Results/Conclusion:** There was a nearly three percent increase in mental health prevalence rates for youth family members (Pre: 8.51 vs. Post: 11.2, $p < 0.05$) of nonfatal shooting survivors in the 12-months post injury compared to the preinjury period but no observed increase in adult family members (Pre: 6.49 vs. Post: 6.49, $p < 0.05$). Stress and anxiety disorders were the most prevalent new mental health diagnoses in the 12-month post injury for both youth (youth: 27.3 vs Medicaid: 16.3) and adult family members (adult: 44.4 vs. Medicaid: 31.5), and rates were significantly higher compared to the general Medicaid population. Findings indicate the need for improved trauma informed services for youth family members in the post injury period. **Innovation & Significance to Field:** Longitudinal individually linked police and Medicaid claims data to define family members of nonfatal shooting survivors and describe their mental health needs to better identify opportunities for trauma informed services for family members.

3. Mental health disparities and pain following firearm violence: A prospective comparison of survivors of firearm injury and motor vehicle collisions

Sydney Timmer-Murillo PhD¹, Sarah Melin BS², Terri deRoos-Cassini PhD^{1,3}

¹Department of Surgery, Medical College of Wisconsin, ²Medical College of Wisconsin, ³Comprehensive Injury Center, Medical College of Wisconsin

Statement of Purpose: Firearm violence is a public health crisis disparately experienced across communities. Following injury from a firearm, there is risk of chronic pain, poorer physical and mental health and long-term disability. Previous literature has demonstrated distinct mental health symptom trajectories in injured populations with negative outcomes for those experiencing chronic or worsening psychopathology. However, the literature is limited regarding symptom trajectories specifically for firearm injury patients, particularly in the acute aftermath of injury. As such, the presentation aims to highlight the differential outcomes that firearm injury survivors experience compared to patients injured in motor vehicle collisions (MVC) to propose best practices for mental health intervention. **Methods/Approach:** The current multi-outcome study assessed differential impact of firearm injury compared to injury sustained from MVC on mental health and physical health outcomes. Participants ($N=131$) presenting to a level 1 trauma center completed measures on posttraumatic stress (PTS), depression, anxiety, general stress, overall physical health and pain 2-weeks and 6-months post-injury. **Results/Conclusion:** Four 2x2 analysis of variance examining groups by time revealed significant interaction effects, where firearm injury patients had increasing PTS symptoms ($F(1,127)=4.61$, $p=.034$, $\eta_p^2=.04$), anxiety ($F(1,127)=8.51$, $p=.004$, $\eta_p^2=.06$), depression ($F(1,127)=5.91$, $p=.016$, $\eta_p^2=.05$) and stress ($F(1,127)=9.47$, $p=.003$, $\eta_p^2=.07$); MVC patients experienced minimal or decreasing symptoms by 6-months. Likewise, firearm injury participants had overall poorer self-reported health ($F(1,40)=7.60$, $p=.009$, $\eta_p^2=.16$) as well as higher pain severity ($t(128)=-3.08$, $p=.003$) and interference ($t(126)=-3.78$, $p<.001$) at 6-months post-injury. **Innovation & Significance to Field:** Results demonstrate poorer recovery across several outcomes following firearm injury, highlighting the need for comprehensive care related to firearm violence. Indeed, poor mental health recovery and pain following injury can have significant implications in quality of life and carry additional financial burden to our patients. This underscores importance of early intervention to reduce the long-term health disparities in this population.

4. Opportunities to reduce barriers to mental health care following pediatric firearm injury

Rachel K. Myers PhD, MS¹, Hillary M. Kapa MPH², Joel A. Fein MD MPH,³

¹Division of Emergency Medicine and Center for Violence Prevention, Children's Hospital of Philadelphia, Philadelphia, PA, ²Center for Violence Prevention, Children's Hospital of Philadelphia, ³Center for Violence Prevention, Children's Hospital of Philadelphia; Division of Emergency Medicine, Department of Pediatrics, University of Pennsylvania Perelman School of Medicine

Statement of Purpose: Trauma-informed case management, such as implemented by hospital-based violence intervention programs (HVIPs), support children and families in addressing post-firearm injury recovery needs and reducing barriers to care. We describe the mental health needs of firearm injured patients enrolled in our pediatric HVIP, highlight barriers to accessing MH care, and outline our approach to helping patients address their MH needs.

Methods/Approach: We calculated the proportion of children ages 8-18 years with firearm injuries between 2017 and 2021 who identified MH needs during participation in our pediatric HVIP. We reviewed case management notes to elucidate individual-, family-, and system-level barriers to addressing MH needs, how our HVIP reduced barriers to care, and extent of MH need resolution through HVIP participation. **Results/Conclusion:** 12.0% (35/292) of patients enrolled in our HVIP experienced firearm injury; 82.9% were male with mean age of 14.6+2.6 years. During HVIP participation, 80.0% of patients and families identified MH needs. Documented barriers to MH care included patient and family schedules; transportation; insufficient availability of community-based providers; prior negative experiences with MH services; lack of trauma-informed policies; and communication challenges between HVIP staff, MH providers, and families. To address these difficulties, we strengthened referral processes and communication pathways with community-based providers, integrated MH providers into our HVIP staff to offer MH care directly, offered both in-home and telehealth MH care, and enhanced collaboration between HVIP case managers and MH staff to validate patients' therapeutic outcomes and encourage adherence. Overall, 82.1% of patients with MH needs had needs met prior to HVIP graduation. **Innovation & Significance to Field:** We have identified opportunities to overcome barriers to MH care following firearm injury utilizing systems of care within our HVIP. Our program's rate of resolution of MH needs exceeds state-level estimates for adolescents generally (82% vs. 40%) and provides an implementation model for similar programs.

5. Heterogeneous Effects of Spatially Proximate Firearm Homicide Exposure on Anxiety and Depression Symptoms Among U.S. Youth

Shani A.L. Buggs PhD MPH¹, Xiaoya Zhang PhD², Amanda Aubel MPH¹, Angela Bruns PhD MEd³, Nicole Kratvitz-Wirtz PhD MPH¹

¹Violence Prevention Research Program, University of California, Davis, ²University of California, Davis, ³Gonzaga University

Statement of Purpose: The burden of firearm homicide in the United States is not evenly distributed across the population; rather, it disproportionately affects youth in disadvantaged and marginalized communities. Much remains unknown about the impacts of exposure to firearm violence that occurs near where youth live or attend school – spatially proximate firearm violence – on youths' mental health and whether those impacts vary by characteristics that shape youths' risk for experiencing that exposure in the first place. **Methods/Approach:** Using a dataset linking the Fragile Families Child Wellbeing Study with the Gun Violence Archive (N=3,086), we employed propensity score matching and stratification to examine average and heterogeneous associations between spatially proximate firearm homicide exposure and anxiety and depression among all youth and then separately for boys and girls. **Results/Conclusion:** We found a statistically significant average association between firearm homicide exposure and symptoms of depression among youth. Furthermore, heterogeneous effects analyses yielded evidence that the average association is driven by youth, and particularly boys, who are the most disadvantaged and have the highest risk of firearm homicide exposure. **Innovation & Significance to Field:** We found a statistically significant average association between firearm homicide exposure and symptoms of depression among youth. Furthermore, heterogeneous effects analyses yielded evidence that the average association is driven by youth, and particularly boys, who are the most disadvantaged and have the highest risk of firearm homicide exposure.

6. Social, Environmental, and Economic Approaches to Firearm Violence Prevention in Cleveland, Ohio

Rose Kagawa PhD MPH¹, Jeremy Prim MA², Colette Smirniotis PhD¹, Karina Patwardhan³

¹Violence Prevention Research Program, Department of Emergency Medicine, School of Medicine, University of California at Davis, ²Department of Sociology, University of California at Davis, ³College of Agricultural and Environmental Sciences, University of California at Davis

Statement of Purpose: Firearm violence prevention approaches take many forms, and research emphasizes the importance of investing in people and their social and physical environments. The objectives of the current study are to describe variation in approaches to violence prevention across neighborhoods in Cleveland, Ohio from 2015-2019 and estimate the effectiveness of one approach: the demolition or rehabilitation of vacant and decaying properties. **Methods/Approach:** This presentation will review an inclusive set of firearm violence prevention approaches, from social programs to alterations to the physical environment, and describe the degree to which these approaches were used in Cleveland, Ohio from 2015 through 2019. We conducted an extensive review of agency websites, news articles, and implementation documents to identify extant violence prevention interventions during the study period and mapped each to Cleveland neighborhoods. We then estimated the effects of one violence prevention approach, the demolition or rehabilitation of vacant and decaying properties, on the incidence of violent crimes involving firearms using Bayesian spatiotemporal models and detailed longitudinal data from 2010-2017. **Results/Conclusion:** There is significant clustering of violence prevention approaches in different areas of the city. For example, therapeutic treatment for those exposed to violence or those at high risk of violence are concentrated in downtown areas, while mentorship programs are more dispersed. Demolition and rehabilitation efforts are concentrated in areas with elevated levels of firearm violence. The estimated effects of demolition or rehabilitation are largely null, regardless of the number of demolitions/rehabs under consideration. **Innovation & Significance to Field:** Understanding the types of violence prevention approaches that are actually in use and their effectiveness as firearm violence prevention tools is critical to identifying where there may be gaps in services or gaps in specific types of services and where there may be over-reliance on one form of prevention or another.

7. Examining the impact of laws changing civilian rights to use deadly force in self-defense: a systematic review, David Humphreys, University of Oxford

David K. Humphreys PhD¹, Alexa Yakubovich PhD², Michelle Degli Esposti PhD³, Brittany C. Lange PhD⁴, G.J. Melendez Torres PhD⁵, Alpa Parmar PhD⁶, Douglas J. Wiebe PhD⁷

¹Department of Social Policy and Intervention, University of Oxford, UK, ²Department of Community Health and Epidemiology, Faculty of Medicine, Dalhousie University, Canada, ³Human Development and Violence Research Centre, Federal University of Pelotas, Brazil & Department of Social Policy and Intervention, University of Oxford, UK, ⁴Child Health and Development Institute, US, ⁵ College of Medicine and Health, University of Exeter, UK, ⁶Faculty of Law, University of Cambridge, UK, ⁷Department of Epidemiology, Biostatistics and Informatics, University of Pennsylvania, US

Statement of Purpose: In recent years US states have introduced changes to self-defense laws with the aim of empowering citizens to use deadly force in self-defense. The public safety implications of “stand your ground laws” have been widely debated in public and policy discourse. The aim of this review was to synthesize the available evidence on the impacts and social inequities associated with changing civilian rights to use deadly force in self-defense on violence, injury, crime, and firearm-related outcomes. **Methods/Approach:** We searched MEDLINE, Embase, PsycINFO, Scopus, Web of Science, Sociological Abstracts, National Criminal Justice Reference Service Abstracts, Education Resources Information Center, International Bibliography of the Social Sciences, ProQuest Dissertations and Theses, Google Scholar, National Bureau of Economic Research working papers, and SocArXiv; harvested references of included studies; and consulted with experts to identify relevant studies. **Results/Conclusions:** We identified 25 studies that estimated population-level impacts of stand-your-ground laws or other expansions to self-defense laws in the United States. Stand-your-ground laws were associated with no change to small increases in violent crime (total and firearm homicide, aggravated assault, robbery) on average across states. Florida-based studies showed robust increases (24% to 45%) in firearm and total homicide while self-defense claims under stand-your-ground law were more often denied when victims were White, especially when defendants

were from racial minorities. **Innovation & Significance to the Field:** The existing evidence contradicts claims that expanding self-defense laws deters violent crime across the United States. In at least some contexts, including Florida, stand-your-ground laws are associated with increases in violence, and there are racial inequities in the application of these laws. Our findings highlight the need for scientific evidence on both population and equity impacts of changes to self-defense laws.

Session 6: Understanding risk & protective factors

Capital Room, November 30, 3:00 - 4:30 PM

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1. Life-course risk factors for homicide: 30-year prospective birth cohort study in Brazil

Joseph Murray PhD^{1,2}, Michelle Degli Esposti PhD^{1,2}, Rafaela Martins PhD^{1,2}, Vanessa Iribarrem Avena Miranda PhD³, Christian Loret de Mola PhD^{1,2,4,5}

¹Human Development and Violence Research Centre, Federal University of Pelotas, Pelotas, RS, Brazil, ²Postgraduate Program in Epidemiology, Department of Social Medicine, Federal University of Pelotas, Pelotas, RS, Brazil, ³Programa de Pós-graduação em Saúde Coletiva da Universidade do Extremo Sul Catarinense, SC, Brazil, ⁴Postgraduate Program in Public Health, Faculty of Medicine, Federal University of Rio Grande, Brazil, ⁵Universidad científica del Sur Lima-Peru, Peru

Statement of Purpose: Homicide is the leading cause of death among young people in Brazil, and is mostly committed using firearms. Life-course criminology highlights the influence of childhood and adolescent experiences as determinants of violence. However, to our knowledge there is only one prospective study of risk factors for homicide (the Pittsburgh Youth Study), which started in late childhood. We aimed to provide unique evidence on risk factors starting at birth, in a 30-year study in Brazil. **Methods/Approach:** A population-based, prospective cohort study started by assessing all children (n=5,914; 51.4% male) born in the city of Pelotas, Brazil, in 1982. Assessments were made during childhood and adolescence, and are ongoing in adulthood. Criminal justice records were successfully linked to the cohort members to identify homicide and violent offences (n=5,646). Childhood and adolescent modifiable risk factors are currently being analysed in relation to male perpetrated homicide and non-lethal violence. **Results/Conclusion:** Up to age 30 years, 75 homicides were committed by 55 cohort participants (72 were committed by 52 males). A further 1,900 non-lethal violent offences were recorded for 625 males. We are analysing the following as potential risk factors between birth and age 4 years: family poverty, maternal age and education, presence of a father figure, number of siblings, smoking during pregnancy, obstetric complications, low birth weight, and early child stimulation. At age 18, the following potential risk factors are examined: victim of parental violence, community assault, grade repetition, alcohol and drug use, and peer drug use. Crude and adjusted associations with homicide and violence will be presented at the meeting. **Innovation & Significance to Field:** Modifiable risk factors for homicide and non-lethal violence need to be identified to inform preventive intervention(s). To our knowledge, this is the second prospective study worldwide, and the only one starting at birth, to assess life-course risk factors for homicide.

2. Inequalities in Gun Victimization and Exposure from Childhood to Early Adulthood

Robert J. Sampson PhD¹, Charles C. Lanfear PhD², Rebecca Bucci PhD¹, David S. Kirk PhD³

¹Department of Sociology, Harvard University, ²Institute of Criminology, University of Cambridge, ³Department of Sociology and Nuffield College, University of Oxford

Statement of Purpose: This paper examines differences in the likelihood of gun violence victimization and exposure through early adulthood, drawing upon data from five survey waves on four birth cohorts of Chicago residents separated in age by 15 years who were studied over the period 1995-2021. Emphasis is put on understanding differences in gun victimization by race, class, cohort, and childhood factors. Specifically, we leverage the multicohort design of the Project on Human Development in Chicago Neighborhoods and its additions (PHDCN+) to examine race, class, and cohort interactions in the probability of being shot or seeing someone else get shot. We are particularly interested in examining if racial inequalities in exposure to violence have declined over time as a result of macrosocial change. We estimate the risk of ever being victimized or exposed to gun violence using survival models. By following multiple birth cohorts over the past 27 years, the PHDCN+ presents a unique opportunity to examine how and why gun violence victimization and exposure vary across race, class and historical period, and how the life course of gun victimization is shaped by early life experiences.

3. Reducing Victimization, Perpetration, and Consequences of Firearm Violence: New Findings from the Northwestern Juvenile Project

Linda A. Teplin PhD¹, Nick Meyerson MA¹, Nanzi Zheng MA MS¹, David Aaby MS², Sara Thomas PhD¹, Karen Abram PhD¹, Leah Welty PhD²

¹Department of Psychiatry and Behavioral Sciences, Northwestern University Feinberg School of Medicine,

²Department of Preventative Medicine, Northwestern University Feinberg School of Medicine

Statement of Purpose: Firearm violence has spiraled into a public health crisis in the United States. As youth in the justice system age, they are at high risk for perpetrating firearm violence and becoming victims. Yet, few studies have examined firearm violence in this highly vulnerable population, or how their experiences with firearms might affect their children. We address this key omission in the literature using new data from the *Northwestern Juvenile Project (NJP)*, the longest prospective, longitudinal study of firearm violence in youth after detention. We examine: (1) how involvement with firearms during adolescence affects perpetration in adulthood, (2) the incidence of firearm injury and death, (3) intergenerational patterns of firearm involvement focusing on the children (ages 10-17) of our original participants. **Methods/Approach:** We analyzed two datasets: (1) 13 waves of interview data from 1829 of the original *NJP* participants (2) data from paired parent-child interviews, conducted with a subset of 300 participants who were living with a biological child aged 10-17. **Results/Conclusion:** Nearly every type of firearm involvement in adolescence—including victimization—predicted the perpetration of firearm violence in adulthood. As they aged, youth in the justice system were more likely to be injured or killed by firearms than comparable groups in the general population. Males had 13.6 times the risk of being shot compared with females. Rates were highest among Black and Latinx males. Among the parents in our sample, more than 4 in 10 had ever owned a gun or perpetrated firearm violence. More than 1 in 10 of their children reported that they had been victimized by guns and 1 in 5 reported easy access to guns. **Innovation & Significance to Field:** Our timely findings will guide the development of preventive interventions needed to reduce the perpetration and victimization of firearm violence in high-risk populations.

4. Mass Shooting Events in Major US Cities Predominantly Affect Communities of Color

Michael Ghio MD¹, John Tyler Simpson MD¹, Ayman Ali MD¹, Katherine Theall PhD MPH², Julia Fleckman PhD MPH², Joseph Constans PhD³, Danielle Tatum PhD¹, Patrick McGrew MD¹, Juan Duchesne MD FACS FCCP FCCM¹, Sharven Taghavi MD MPH MS FACS FCCP¹

¹Tulane University School of Medicine, Department of Surgery, ²Tulane University School of Public Health and Tropical Medicine, ³Tulane University School of Science & Engineering

Statement of Purpose: Mass shooting events (MSE), defined as shootings involving 4 or more victims, are frequent occurrences in major metropolitan cities in the United States (US). MSE are a distinct type of violence that differ from other forms of gun violence and there is little data examining the root causes of MSE. This study sought to investigate the relationship between structural racism and mass shootings in major metropolitan cities in the US. We hypothesized that measures of structural racism would not be associated with MSE. **Methods/Approach:** This was a cross-sectional analysis examining MSE, as reported by incident address, from 2015 to 2019, using the Gun Violence Archive in the largest 51 US major metropolitan statistical areas (MSA). Demographic data and Gini coefficient were obtained from the US Census Bureau and the US Department of Education. The Black-White Segregation Index (SI) and other measures of structural racism were obtained from the Brookings Institute. Spearman ρ and linear regression were performed. **Results/Conclusion:** Higher segregation index ($r=0.46$, $p<0.001$) was associated with MSE using Spearman rho analysis (Figure 1). Percent of the population that is African American (AA)/Black ($r=0.76$, $p<0.001$), children in a single parent household ($r=0.44$, $p<0.001$), and violent crime rate ($r=0.34$, $p<0.05$) were other variables associated with mass shooting events. On linear regression, structural racism, as measured by percent of the population that is AA/Black, was associated with MSE ($\beta=0.098$, $p<0.001$). Segregation Index ($\beta=0.016$, $p=0.53$) and Gini coefficient ($\beta=-1.02$, $p=0.93$) were not associated with MSE on linear regression. **Innovation & Significance to Field:** Structural racism may influence mass shooting events in major US cities as communities of color are more likely to be affected. Social and community-based programs that address structural causes of MSE are necessary to positively impact the gun violence epidemic.

5. Increased Tree Canopy Coverage is Associated with Lowering Shooting Incidence in Philadelphia

Christian L. Jacovides MD¹, Melissa A. Hornor MD¹, Joanelle A. Bailey MD¹, Gary A. Bass MD PhD¹, Jessica H. Beard MD MPH², Mark J. Seamon MD MPH¹, Eugenia C. South MD MSHP³, Elinore J. Kaufman MD MSHP¹

¹Division of Trauma, Surgical Critical Care, and Emergency Surgery, Department of Surgery, University of Pennsylvania, ²Division of Trauma and Surgical Critical Care, Department of Surgery, Temple University Hospital, ³Urban Health Lab, Perelman School of Medicine at the University of Pennsylvania

Statement of Purpose: Environmental factors can exert powerful influences on violence. Spending more time in areas with more trees has been associated with a lower likelihood of becoming a victim of firearm violence, but city-wide tree coverage has not been linked to firearm violence. We hypothesized that areas with greater tree canopy coverage would be associated with fewer neighborhood shootings. **Methods/Approach:** We obtained 2020 data from American Forests on tree canopy coverage in Philadelphia by census block group (CBG) and shooting locations from the Philadelphia Police Department. Canopy gap was reported as a normalized score from 0-1 (higher gap = less coverage). We used multivariable zero-inflated negative binomial regression to analyze the association between shooting incidence and canopy coverage, adjusting for socioeconomic, demographic, and health factors. **Results/Conclusion:** From 1/1/15 to 12/31/21, there were 10,693 shootings in 1,023 of 1,328 CBGs. Median canopy gap was 0.16 (IQR 0.11-0.22). The two factors with the greatest association with increased shootings were larger canopy gap (IRR 3.8±1.4, p<0.001) and higher percent of persons of color in the CBG (IRR 4.9±0.8, p<0.001). Increased unemployment rate (IRR 1.9±0.6, p=0.028), higher percent poverty (IRR 1.5±0.3, p=0.057), and higher incidence of asthma (IRR 1.18±0.04, p<0.001) were all associated with increased shooting rates; higher percentages of seniors (IRR 0.3±0.1, p=0.012) and children (IRR 0.5±0.1, p=0.014) were associated with decreased shootings. Decreased canopy was significantly associated with increased shootings among shootings occurring at night, in which the victim was Black or male, and in both indoor and outdoor locations. **Innovation & Significance to Field:** Increased tree coverage was associated with decreased firearm violence in Philadelphia. Tree coverage may be both a marker for broader structural disadvantage and a direct protective factor. Increasing equity in urban tree cover may be one element of a multifaceted approach to curbing the U.S. firearm injury crisis.

6. Measuring Firearm Access and Storage: Improving Understanding and New Directions

Lauren Hudak MD MPH^{1,2}, Carrie Bissel MD³, Henry Schwimmer MD⁴, William Warnock MD¹, Sarah Kilborn MD⁵, Tim Moran PhD¹, Jonathan Rupp PhD^{1,2}

¹Emory University School of Medicine, Department of Emergency Medicine, Atlanta, GA, ²Rollins School of Public Health, Emory University, Atlanta, GA, ³Atrium Health Carolinas Medical Center, Department of Emergency Medicine, Charlotte, NC, ⁴Alameda Health, Highland Hospital, Department of Emergency Medicine, Oakland, CA, ⁵Vanderbilt Medical Center, Department of Emergency Medicine, Nashville, TN

Statement of Purpose: Counseling patients with the goal of improving firearm storage practices can decrease the risk for firearm injury. Effective strategies require accurate information on storage practices, and the current use of multiple-choice (MC) survey questions to accurately capture firearm storage is being assessed. We also explore whether a novel visual scale may result in better characterization of firearm storage. **Methods/Approach:** Patients from academic-affiliated urban and rural community emergency departments (EDs) were surveyed using MC questions modeled from a validated national instrument and underwent structured interviews about their firearm safety practices. Participants were guided through a Firearm Storage Safety Scale (FSSS) to self-assign a score from 1 to 7. Responses to the SI were coded using the same approach and the agreement between survey questions and interview responses was calculated using percentage agreement as well as Cohen's K. Interrater reliability between initial FSSS rating and blinded review of written narratives was calculated using the weighted Cohen's K. **Results/Conclusion:** The absolute agreement between patients' self-reported firearm storage practices on MC questions and their verbal answers to SI questions was moderate (70.5%, 95% CI: 60.8 - 79.0). Reliability was lower than the accepted cutoff for even basic research (Cohen's κ = 0.61, 95% CI: 0.49 - 0.73; Nunnally, 1979). Reliability between researcher-independent assigned FSSS and guided FSSS was high, 0.88 (95% CI: 0.77 - 0.96). **Innovation & Significance to Field:** Standard MC questions did not reliably capture patients' firearm storage habits and could complicate efforts to address firearm injury on an individual and population level. Novel measures, such as the FSSS,

may serve as a useful tool to better capture key elements of firearm storage for at-risk patients and improve standardization for intervention approaches. Future research should explore both prior firearm storage measures and novel visual tools to better understand and capture how patients are storing and handling their firearms.

7. More is not always better: Examining the cumulative effects of school safety policies on perceptions of school safety for youth of color

Leigh Rauk PhD¹, Carissa J. Schmidt PhD MPH¹, Karissa Pelletier PhD¹, Justin E. Heinze PhD², Rebecca M. Cunningham MD¹, Patrick M. Carter MD¹, Marc A. Zimmerman PhD¹

¹University of Michigan Institute for Firearm Injury Prevention, ²University of Michigan Health Behavior and Health Education

Statement of Purpose: We studied the relationship between school safety policies at school and student perceptions of school safety for Youth of Color (YOC) in comparison to non-Hispanic, White youth. **Methods/Approach:** The FACTS national survey is a cross-sectional, web-based survey (06/2020-07/2020) of 2,924 U.S. parents and their teens regarding firearm-related practices. We conducted a hierarchical linear regression to assess whether an association exists between the total number of school safety policies implemented at school and youths' perceptions of school safety, and whether this relationship is moderated by youths' race/ethnicity. We ran additional hierarchical linear regression models to examine the relationships between youths' race/ethnicity, groupings of school policies (armed security, student search, and active shooter drills), and youths' perceptions of school safety. **Results/Conclusion:** In our full model, we found a main effect of race/ethnicity on youths' perceptions of school safety in that YOC ($b = -0.07$, $p = 0.01$) had lower perceptions of school safety than non-Hispanic, White students. Results showed a significant interaction between YOC and the number of safety policies implemented at school ($b = -0.08$, $p < .001$), suggesting that an increase in the number of school safety policies is associated with lower perceptions of school safety for YOC compared to non-Hispanic, White students. We found a significant interaction between YOC and the number of armed security policies ($b = -0.11$, $p = 0.009$) and student search practices ($b = -0.16$, $p < .001$) in that an increase in each type is associated with a reduction in perceptions of school safety for YOC but not for non-Hispanic, White youth. **Innovation & Significance to Field:** Our findings offer insight for U.S. school administrators and policy makers to help with determining the number and types of policies needed to keep students safe.

Session 7: Enhancing the firearm data infrastructure through innovative data and methods (Part I)

Empire Ballroom, November 30, 3:00 - 4:30PM

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1. The value of geospatial analysis for determining regional risk and protective factors for firearm violence

Abiodun Oluyomi PhD¹, Ned Levine PhD²

¹Baylor College of Medicine, Department of Medicine, Epidemiology and Population Sciences, ²Ned Levine and Associates (Geospatial analysis and modeling expert)

Statement of Purpose: Geospatial analysis can be a valuable tool to analyze firearm injury. “Hot spots” are clusters of neighborhoods where there are a disproportionate number of firearm incidents. Social disparities in access to education, income, and housing can create environments for “structural violence,” and identifying pockets can enable primary prevention interventions for firearm assault. Individual and neighborhood-level correlates for other shooting intents can also be described using these techniques. **Methods/Approach:** Demographic, geographic, temporal, social, and socioeconomic risk factors are determined from analysis of the integrated database and crime records. Geographic Information System (GIS) techniques are used for analysis and results, stratified by shooting intent. Shooting and residential addresses for victims are mapped to small geographical areas that encompass a neighborhood and GIS techniques are utilized to identify residential neighborhood-level predictors and clusters of firearm violence within the County. **Results/Conclusion:** Analysis on our current work is still underway; however, prior similar work by our geospatial expert on 2014 adult firearm deaths in the same County showed distinct local and global and spatial trends¹. Firearm homicides were concentrated into eleven small clusters that contained 35% of the homicides. The firearm suicides were more dispersed, with only four small clusters in suburban neighborhoods that only contained 11% of suicides. Neighborhood (census block groups) predictors found that higher firearm homicide rates were associated with higher percentages of Black males ages 15-29, and higher percentage of the population living below the poverty line. However, the only neighborhood predictor for firearm suicides was percentage of non-Hispanic White males. In our current cohort, we will also analyze pediatric firearm data. This is all highly valuable data to inform injury prevention. **Innovation & Significance to Field:** Geospatial analysis can provide useful local data and trends of firearm injury to guide prevention efforts.

2. The Greater Houston Model: An integrated system for comprehensive local firearm injury surveillance

Bindi Naik-Mathuria MD MPH FACS FAAP¹, Ned Levine PhD², Lisa Pompeii PhD^{1,3}, Abiodun Oluyomi PhD⁴

¹Department of Surgery (Pediatric Surgery and Trauma), Baylor College of Medicine, ²Ned Levine and Associates, ³Center for Epidemiology and Public Health, ⁴Baylor College of Medicine, Department of Medicine, Epidemiology and Population Services

Statement of Purpose: To create an integrated database for firearm injury surveillance for a large urban County in order to define the problem and identify risk factors and social correlates based on a socioecological injury prevention framework to inform and tailor injury prevention programs. **Methods/Approach:** Firearm injury data is integrated from four sources: 1. All major trauma center registry and hospital records: data on fatal and non-fatally injured patients, Non-fatal injuries, fatal injuries, residence and shooting locations (from Emergency Medical Services records), shooting intent, and individual social determinants are available. 2. County medical examiner's (ME) office death records and forensic records: data on fatally injured individuals, which includes both deaths within trauma centers and in other settings. Fatal injuries residence and shooting locations, shooting intent, shooting details and social correlates are available. 3. Police records from all major police departments: crime incident data on the individuals identified from sources 1 and 2 and all crimes including a firearm. All crimes involving guns (with or without injury/death) including shooting locations can be obtained, which is useful to identify hot spots. 4. US Census, Houston-Galveston Area Council, and local records: data on neighborhood socioeconomic characteristics is determined from spatial analysis of the residential addresses for victims (sources 1 and 2) and shooting locations

(sources 2 and 3). **Results/Conclusion:** Thus far, we have collected and analyzed the pediatric data (a separate abstract was submitted with this data). Socioecological models have been developed for each shooting intent (assault, bystander, unintentional and suicide/self-harm), and hot spots of shooting locations and super neighborhoods have been identified. Based on these data, community-based injury prevention programs will be developed. **Innovation & Significance to Field:** This is a unique county-based firearm surveillance model that will provide detailed useful data to learn more about risk and protective factors for firearm injury.

3. Firearm Injuries Treated in Emergency Departments – CDC Firearm Injury Surveillance Through Emergency Rooms (FASTER) Program, 9 States and the District of Columbia, 2018-2021

Marissa L. Zwald PhD MPH¹, Miriam Van Dyke PhD MPH¹, Thomas Simon PhD¹

¹*Division of Violence Prevention, National Center for Injury Prevention and Control, CDC, Atlanta, GA*

Statement of Purpose: The availability of timely and multistate trend data on nonfatal firearm injuries is limited. This data gap was addressed by analyzing annual rates of emergency department (ED) visits for firearm injuries during 2018-2021 among 10 jurisdictions participating in CDC's Firearm Injury Surveillance Through Emergency Rooms (FASTER) program. **Methods/Approach:** Available aggregate data from January 1, 2018, through December 31, 2021, in the District of Columbia, Florida, Georgia, New Mexico, North Carolina, Oregon, Utah, Virginia, Washington, and West Virginia were analyzed. CDC collaborated with state and local health departments to develop a syndrome definition to query ED data for initial firearm injury-related visits. The syndrome definition includes combinations of discharge diagnosis codes (ICD-10-CM, ICD-9-CM, and SNOMED) and keyword search terms in the chief complaint fields associated with firearm injury. Relative rate changes for firearm injury ED visits per 100,000 ED visits were calculated by year, and stratified by sex, age group, county urbanization, and jurisdiction. **Results/Conclusion:** During 2018-2021, 86.7 million ED visits reported in the 10 jurisdictions qualified for inclusion in the analyses. Among these, 65,975 firearm injury ED visits were identified. Changes in annual rates of ED visits for firearm injuries occurred during 2018-2019 (3% relative increase), 2019-2020 (61% relative increase), and 2020-2021 (10% relative decrease). Relative changes in annual rates were largest from 2019-2020, with rate increases observed regardless of sex, age, and county urbanization, and for all jurisdictions, except West Virginia. **Innovation & Significance to Field:** For the first time in the United States, state health departments are reporting real-time syndromic surveillance to CDC to monitor ED firearm injury visits. CDC and FASTER jurisdictions are continuing to refine syndrome definitions for firearm injury by intent to help detect abnormal patterns in firearm injury ED visits at more local levels, facilitate rapid response, and ultimately, prevent the spread of violence in communities.

4. Defensive Gun Use in the Gun Violence Archives: A Typology of Incidents

David Hemenway PhD^{1,2}

¹*Harvard Injury Control Research Center,* ²*Harvard TH Chan School of Public Health*

Statement of Purpose: In the past decade, most people who bought guns did so for self-defense. Yet little is known about actual defensive gun use in the United States. **Methods/Approach:** To discover what information news reports might add, we read the reports of defensive use incidents assembled by the Gun Violence Archive (GVA). We examined a representative sample of a quarter of the incidents from 2019, the last year before the pandemic. We created a typology of defensive gun use incidents. **Results/Conclusion:** Of over 400 incidents, the victim fired their gun in almost 90%. The average number of perpetrators shot per incident was 0.75; the average number of victims shot was 0.25. We estimate that in 2019 fewer than 600 potential perpetrators were killed in defensive gun use incidents that made the news. Among the thirteen categories of defensive gun use were drug related (4% of incidents), gang-like combat (6%), romantic partner disputes (11%), escalating arguments (13%), store robberies (9%), street robberies (5%), unoccupied vehicle theft (5%), unarmed burglaries (7%), home invasions (20%) and miscellaneous (8%). **Innovation & Significance to Field:** We believe the GVA dataset includes almost all news reports of defensive gun use and that the news reports most incidents in which someone is shot and dies. Some of the strengths of using news reports as a data source are that we can be certain that the incident occurred, and the reports provide us with a story behind the incident, one usually vetted in part by the police with occasional input from the victims, perpetrator, family, witnesses, or neighbors. Defensive gun use situations are quite diverse, and

among the various categories of defensive gun use, a higher percentage of incidents in some of the categories seemed less likely to be socially beneficial (e.g., drug-related, gang-like, escalating arguments) than in others (e.g., home invasions).

5. Estimates of substate firearm ownership rates over time

Andrew R. Morral PhD¹, Brian Vegetabile PhD¹, Terry L. Schell PhD¹, Emma Thomas PhD², Rosanna Smart PhD¹

¹RAND, ²Google

Statement of Purpose: Little is known about how household firearm ownership rates have changed over time for demographic subgroups within and across states. This research describes our estimates of household firearm ownership rates over time among substate demographic strata defined by gender, marital status, race and urbanicity, and compares our estimates to the most common proxy for firearm ownership, the proportion of all suicides in a population that were firearm suicides (FS/S). **Methods/Approach:** We use Bayesian machine learning models on survey data of household firearm ownership from 17 waves of the General Social Survey and 3 waves of the Behavioral Risk Factor Surveillance System. This approach yields smoothed and regularized estimates of household firearm ownership for 16 demographic strata within each state and year, 1990 to 2019. We then compare these survey-based estimates to raw and smoothed FS/S proxies of ownership. **Results/Conclusion:** White and rural Americans have gun ownership rates twice those of non-whites or urban dwellers. Unmarried women have household ownership rates half those of married women. After decreasing in the 1990's, all demographic strata have seen recent increases in firearm ownership starting between 2014 and 2017. At the national level, our estimates of household ownership correspond with FS/S ($\rho = 0.92$), but the association is not constant across major demographic strata. At the substate level, smoothed FS/S shows greater variation and larger discrepancies with our estimates in ownership rate magnitudes and trends. **Innovation & Significance to Field:** Gun violence prevention research often requires estimates of firearm ownership at the state or substate level, but good gun ownership time-series have been unavailable. The gun ownership estimates we have produced for public distribution appear superior to conventional proxy measures when used to describe ownership trends among population subgroups, and may help improve research on gun policy effects, disparities in violence exposure, and other firearm injury and violence prevention topics.

6. Childhood exposure to firearm violence and adolescent/adult firearm use: Insights from integrative data analysis

Paul Boxer PhD¹, Eric Dubow PhD^{2,3}, L. Rowell Huesmann PhD³

¹Department of Psychology, Rutgers University, ²Department of Psychology, Bowling Green State University,

³Research Center for Group Dynamics, University of Michigan

Statement of Purpose: Despite the broad literature showing the impact of violence exposure on youth (Boxer & Sloan-Power, 2013), we know little regarding how experiences with firearm violence during childhood predict *involvement in firearm violence* later in development. We will share the results of *integrative data analyses* (IDA) linking longitudinal samples from Flint, MI, and Jersey City, NJ, to address how: 1) *childhood exposure to firearm violence accounts for later involvement with firearms*; and 2) *beliefs supportive of violence account for relations between childhood violence exposure and later firearms involvement*. **Methods/Approach:** From *Flint*, we have multi-source data from three cohorts of youth (total N=426; 2nd, 4th, and 9th graders, 75% nonwhite) assessed first in 2007 for three consecutive years, then assessed again in 2016 (ages 16-23) and 2020 (ages 20-27). From *Jersey City*, we have multi-source data from 200 10th graders (90% nonwhite) assessed in four annual waves ending one-year post-graduation. Samples include similar measures of key constructs. We used IDA, which permits robust inference through simultaneous analysis of multiple data sets (Curran & Hussong, 2009). **Results/Conclusion:** Frequency of exposure to neighborhood firearm violence began at 45% of 7 year olds, then increased to 70% by age 14-15 and stabilized through age 27. Cumulative frequency of firearm carrying increased from 3% during middle adolescence to 24% by age 27. By about age 19, exposure to neighborhood firearm violence and normative beliefs justifying firearm use both predicted firearm carrying. Analyses will examine whether the relation between early exposure to firearm violence and later firearm use is mediated by weapons-related beliefs. **Innovation & Significance to Field:** Our novel use of IDA revealed patterns in line with contemporary models of the development

of aggressive/violent behavior (Huesmann, 2018). Observed developmental trends in experiences with firearms suggest the need for prevention programming to begin by early adolescence.

7. Quantitative and Qualitative Perspectives on Firearm Injuries among Veterans Nationally

Yachana Bhakta MPH¹, Lauren Maxim PhD¹, Megan Lafferty PhD¹, Susan DeFrancesco JD MPH^{1,2}, Kathleen F. Carlson MS PhD^{1,2}

¹VA Portland Healthcare System, ²Oregon Health and Science University – Portland State University School of Public Health

Statement of Purpose: Patterns of firearm injuries and differences in firearm injury trends by individual characteristics are not well understood. To better evaluate opportunities for firearm injury prevention from within the healthcare setting, this study examined injury patterns and healthcare treatment among a national sample of Veterans treated for firearm injury. A complementary qualitative study examined perspectives of Veterans who experienced a firearm injury. **Methods/Approach:** A national random sample of Veterans with firearm injury-related visits to a VA facility between January 1st, 2010 and December 31st, 2019 was identified using VA administrative data. Comprehensive chart reviews were conducted to collect Veteran demographics, injury circumstances, and healthcare treatment data. Frequencies of injury circumstances and treatment characteristics were examined. Qualitative methods for the Database of Individual Patient Experiences (DIPEX) were used to interview Veterans who experienced firearm injuries. Their perspectives on firearms and ownership as well as experiences with firearm injuries and interactions with the healthcare system were recorded and transcribed; transcripts were analyzed using thematic analysis. **Results/Conclusion:** From chart reviews, a majority of injuries were nonfatal (94.1%). About half (47.1%) were unintentional injuries. The shooter was the patient for 61.8% of injuries. Most injuries (81.9%) were first treated at a local emergency department, with follow-up care received at a VA. During DIPEX interviews, patients described their diverse firearm injury experiences and consequences. These audio and video clips or written transcripts of Veterans' experiences can be used to increase healthcare providers' understanding of and approaches to prevention of firearm injuries. **Innovation & Significance to Field:** Using both quantitative and qualitative data allows for a more robust understanding of Veterans' experiences with firearm injuries and interactions with the healthcare system. This work will support efforts to develop and implement a comprehensive firearm injury prevention program from within the national VA healthcare system.

Session 8: Understanding and addressing disparities: Epidemiology and intervention (Part I)

Congressional Rooms, December 1, 8:30-10:00AM

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1. Store Safely: A culturally tailored universal prevention strategy for rural families

Cynthia Ewell Foster PhD^{1,2}, Christina Magness LMSW¹, Sarah Derwin BA³, Tayla Smith MPH¹, Eskira Kahsay MPH⁴, Cheryl King PhD¹

¹Department of Psychiatry, University of Michigan, ²Institute for Firearm Injury Prevention, University of Michigan,

³Marquette County Health Department, ⁴School of Public Health, The University of Michigan

Statement of Purpose: Firearms are now the leading cause of death for youth in the US (Goldstick et al, 2022). Safe firearm storage is an evidence-based risk reduction technique (Grossman et al, 2005) yet many families with children maintain unsecured firearms (King et al, 2020). In rural areas where gun ownership is common (Parker et al, 2017) and rates of firearm-related youth suicides are increasing (Goldstick et al, 2021), developing culturally acceptable and feasible safe storage prevention strategies may have promise for reducing morbidity and mortality.

Methods/Approach: This intervention development pilot study used a community-based participatory research strategy to develop a culturally tailored multi-component online safe storage prevention strategy for rural families. Acceptability, feasibility, and preliminary impact on family storage behaviors were measured in a sample of 45 rural firearm owning families with children. Parents (35% male, 65% female, 98% Caucasian, 5% Native American) ranged in age from 26-52 (mean= 37.88, sd=6.14) with an average of 2.3 children at home ranging from infancy through high school. Families completed a pre-test survey, participated in the online intervention, and completed a post-test survey. **Results/Conclusion:** Of the 43 families retained at follow-up, 98% reported engaging with all intervention components (video, infographic, decision aid, and home safety checklist); 86% completed the home safety checklist. 40% of families self-reported making a change to their storage, offering examples such as purchasing gun locks, safes, or lockboxes; separating ammunition from weapons; reviewing the safety of current storage practices; and relocating firearms to a location harder to access by their children. 80% found the website culturally sensitive and would recommend the materials to other parents. **Innovation & Significance to Field:** Firearm safety interventions may have more appeal if they are developed with input from the community and are tailored to community norms and values.

2. Firearm violence Exposure and its potential consequences among young adults experiencing homelessness: Rates and correlates

Hsun-Ta Hsu PhD¹, Anthony Fulginiti PhD², Robin Petering PhD³, Anamika Barman-Adhikari PhD², Kenneth Bendell MSW¹, Kristin Ferguson PhD⁴, Sarah Narendorf PhD⁵, Jama Shelton PhD⁶, Diane Santa Maria DrPH⁷, Kimberly Bender PhD², Eric Rice PhD⁸

¹School of Social Work, University of Missouri - Columbia, ²Graduate School of Social Work, University of Denver,

³Lens. Co, ⁴School of Social Work, Arizona State University, ⁵Graduate College of Social Work, University of Houston,

⁶Silberman School of Social Work, Hunter College, ⁷Cizik School of Nursing, University of Texas Health Science Center at Houston, ⁸Suzanne Dvorak-Peck School of Social Work, University of Southern California

Statement of Purpose: Over 4.2 million youth and young adults experience homelessness each year. Without stable housing, young adults experiencing homelessness (YAEH) are especially vulnerable to violence, as compared to their housed peers. Although research on violence exposure among YAEH is abundant, YAEH's victimization and perpetration of firearm violence remain understudied. Firearm violence prevention interventions may not be effective among this vulnerable population without taking the homelessness context into consideration. Therefore, this study aims to: 1) explore the rates of firearm violence exposure (i.e., direct and indirect firearm violence victimization and firearm violence perpetration) among YAEH; and 2) investigate correlates of YAEH's firearm violence exposure. **Methods/Approach:** YAEH aged 18-26 from seven major cities in the U.S. across homeless service spectrum were recruited and surveyed (N=1,426). Logistic regression analyses were conducted to examine correlates of direct firearm violence victimization, indirect firearm violence victimization, and firearm violence perpetration separately. **Results/Conclusion:** This study identified high rates of firearm violence exposure among

YAEH (indirect victimization: 40%; direct victimization: 28%; perpetration: 18%). Childhood trauma and street victimization history were associated with elevated risk of firearm violence exposure risks. Contrary to common public beliefs, racial minority YAEH and YAEH with mental illness were at higher risk of both direct and indirect firearm violence victimization, but not perpetration. Considering that risk factors for violence are often embedded in social and structural contexts, community-based approaches to prevent firearm violence among YAEH are necessary, especially for YAEH subgroups particularly vulnerable to firearm violence. Finally, integrating trauma informed care in firearm violence prevention interventions is also critical to YAEH. **Innovation & Significance to Field:** This is the first known study to examine firearm violence and its correlates among YAEH across diverse regions in the U.S. Such understanding provides critical insights for informing future firearm violence prevention efforts targeting YAEH.

3. Perspectives on firearm and medication-related suicide prevention interventions among veterans seeking emergency care

Joseph A. Simonetti MD MPH^{1,2,3}, Ryan Holliday PhD^{1,4}, Joseph Mignogna PhD^{1,5}, Suzanne Thomas MA¹, Lisa A. Brenner PhD^{1,4,5}, George Sayre PhD^{6,7}

¹Rocky Mountain Mental Illness Research, Education and Clinical Center for Suicide Prevention, Veterans Health Administration, Aurora, CO, ²Division of Hospital Medicine, University of Colorado Anschutz School of Medicine, Aurora, CO, ³Program for Injury Prevention, Education & Research, Colorado School of Public Health, Aurora, CO, ⁴Department of Psychiatry, University of Colorado, Anschutz Medical Campus, Aurora, CO, ⁵Department of Physical Medicine and Rehabilitation, University of Colorado, Anschutz Medical Campus, Aurora, CO, ⁶Denver-Seattle Center of Innovation for Veteran-centered and Value-driven Care, Veterans Health Administration, Seattle, WA, ⁷Department of Health Systems and Population Health, University of Washington School of Public Health, Seattle, WA

Statement of Purpose: Lethal means counseling aims to promote firearm and medication safety among at-risk individuals, but interventions have not been evaluated among veterans and little is known about preferences for intervention components or factors impacting delivery. We explored perspectives on such interventions among veterans with elevated suicide risk who sought emergency care. **Methods/Approach:** From April-June 2022, we conducted semi-structured interviews with veterans who were recently treated in a VA emergency room and identified as having elevated suicide risk during that visit. Interview guides were developed to explore perspectives on interventions delivered in emergency care settings, including intervention obstacles and relevant contextual factors, and to explore perspectives on specific methods to secure or remove household firearms and medications (e.g., lockboxes, medication disposal envelopes). We audio-recorded and transcribed discussions and completed structured debriefs to identify key themes that emerged across interviews. **Results/Conclusion:** Of 16 participants, 13 identified as male and 12 as non-Hispanic White. Overall, participants were supportive of firearm and medication interventions for veterans, but were unclear whether interventions aimed at preventing suicide, unintentional overdose/injury, medication errors, or theft. Many endorsed their usefulness for others but not themselves, either because they did not believe they were at increased risk of injury or that they “would just find a way” to die regardless of interventions. A common barrier to securing or removing lethal means was their potential future utility (e.g., firearms for protection; might need medications again). Preferences varied for the five proposed medications and four proposed firearm interventions, but each participant endorsed at least one as acceptable. **Innovation & Significance to Field:** These findings suggest that interventions among this population may benefit from clear messaging to provide reasoning for recommendations, and that common suicide-related biases are likely to impact effectiveness. Interventions may need to offer individualized safety methods to meet the needs of this diverse population.

4. Uncovering a paradox: American perceptions of gun-related safety by race and gun ownership

Julie A. Ward MN RN PHNA-BC¹, Talib Hudson PhD², Mudia Uzzi MSc¹, Daniel W. Webster ScD MPH¹, Cassandra K. Crifasi PhD MPH¹

¹Center for Gun Violence Solutions, Johns Hopkins Bloomberg School of Public Health, ²The New Hood, The New School, New York, NY 10011,

Statement of Purpose: From 2019-2021 approximately 40% of first-time gun purchasers were Black or Hispanic, compared to 30% of existing gun owners in 2015. For more than 90% of 2020's first-time and repeat gun purchasers, family- and self-protection was a primary motivator of the purchase. The purpose of this study was to assess Americans' perceptions of gun-related safety and any differences among gun-owner and race/ethnicity subgroups based on a nationally representative sample of US adults. **Methods/Approach:** The 2021 National Survey of Gun Policy was fielded 1/4/21-1/20/21 using NORC's AmeriSpeak Panel, with oversampling for Black, Hispanic, and gun-owning respondents. The survey assessed agreement with statements that "Personally owning a gun will make me safer" and "I would feel safer if more people were allowed to legally carry guns." Responses were dichotomized. Survey weights were applied for within- and between-group comparisons. Sensitivity tests compared pre- and post-insurrection responses. **Results/Conclusion:** Survey completion rate was 78% (N=2778). Overall, 46% of respondents agreed that personal gun ownership will make them safer, and 26% agreed that they would feel safer if more people could legally carry guns. Gun owners' agreement was stronger (72% and 42%, respectively). Fewer Black (60%) and Hispanic (60%) than white gun owners (79%) agreed that gun ownership made them safer. Just 28% of Black gun owners agreed that they would feel safer if more people could legally carry guns. Sensitivity tests suggest stability of estimates. **Innovation & Significance to Field:** Traditional sampling methods limit opportunity to assess views of gun owners and gun-owner subgroups. We found that despite purchasing a gun, feelings of safety remain unassured among many Black and Hispanic gun owners. Overall, American adults tended to disagree with the safety of increasing legal gun carry. We discuss the significance of these findings, considering equity and current bureau trends in the deregulation of concealed carry.

5. Galvanizing Iron: Racial Justice Protests and Gun Desirability During a Global Pandemic

Justin Lucas Sola PhD Candidate MA¹, Bryan L. Sykes¹

¹University of California, Irvine - Department of Criminology, Law and Society

Statement of Purpose: Research shows that thousands of homicides and suicides are committed annually with guns (Azrael et al. 2017). Yet, an evaluation of the causes of gun desirability remains relatively unexplored in previous research, highlighting this area of scholarship as a significant arena for potential policy interventions around violence and self-harm. **Methods/Approach:** In this article, we leverage a unique dataset created from multiple data sources (a video experiment, protest turnout, and census data) to examine how the Black Lives Matter (BLM) protests in Spring 2020 affected local and national gun desirability. A validated measure of gun desirability now enables scholars to evaluate these theories, discern trends in desire for guns, and suggest policy changes accordingly (Sola 2021). We use gun desirability measures as an outcome measure, derived from an online sample of 8,484 US residents. For each participant we also calculate the cumulative exposure to state (coded as 'local') and outside-of-state (coded as 'non-local') BLM-related related protest events, protestors, and news articles. An innovative protest data source - the Count Love project - enables us to estimate BLM protest intensity. This dataset allows us to: (1) Determine the number of protest events, by day, on a per-state basis, (2) Weight those events by estimated attendance, when available (~80+% of events have estimated attendance), (3) Determine the protestor's affiliation - e.g. abortion, guns, BLM, (4) And thereby calculate cumulative BLM protestors per capita (standardized to per 100k residents, as of the most recent census) by state by day. With this calculation, we can create an interaction term for each participant that uses their survey start date to calculate a cumulative protestors-per-capita for each participant's state. We can create similar measures for *news articles per protest*, and of course *protest events*, similarly sorted by state and accumulated by day. **Results/Conclusion:** Fractional logit regressions, and zero- and one-inflated beta regressions, are performed to estimate marginal changes in gun desirability. Preliminary results show that exposure to the BLM protest movement significantly increased gun desirability for conservatives while reducing desirability among liberals. **Innovation & Significance to Field:** Our findings illustrate how perceived criminal threats and responses to neoliberalism structure gun desirability during social movements for racial justice and a global pandemic.

6. The Implications of the Bruen Decision on Racial Disparities in Gun Violence

Michael R. Ulrich JD MPH^{1,2}

¹Boston University School of Public Health, ²Boston University School of Law

Statement of Purpose: The purpose of this presentation is to contextualize the impact of the Supreme Court's decision in *New York State Rifle and Pistol Association v. Bruen* on the gun violence epidemic. **Methods/Approach:** This presentation will analyze the *Bruen* decision through both a constitutional and public health lens. It will examine the opinion for its use, if at all, of public health data as well as explain what the result will mean for racial disparities in gun violence. Research around implicit biases, especially as they relate to Black men, and data surrounding Stand Your Ground laws will be useful to demonstrate the risks of the Court declaring a right to carry firearms in public. As we have seen in cases like Kyle Rittenhouse and Ahmaud Arbery, more individuals could feel empowered to arm themselves and police the streets. The law's use of a reasonableness standard, which typically asks jurors whether an individual was reasonable to have feared for their safety, will be increasingly important in a world where any disagreement could turn deadly. Again, biases will play a vital role in the outcomes of these cases and, unfortunately, this likely will result in the protection of White citizens to the detriment of people of color. Therefore, this case has significant implications for the quest for racial justice. **Results/Conclusion:** If the opinion strikes down the proper cause restriction as most expect, it will exacerbate racial disparities in gun violence and, as a result, could provide justification for increased policing that will disproportionately target communities of color. **Innovation & Significance to Field:** This work bridges the gap between constitutional theory and public health research to provide a detailed, empirically-driven assessment of what legal and policy options are available in the fight against gun violence and racial disparities.

7. Assessing the intersection of historic contemporary structural racism on firearm violence in Baltimore City

Mudia Uzzi MSc^{1,2}, Julie Ward MN RN PHNA-BC¹, Shani Buggs PhD³, Graham Mooney PhD⁴, John Jackson ScD⁵, Daniel Webster ScD¹, Cassandra Crifasi PhD¹

¹Center for Gun Violence Solutions, Johns Hopkins Bloomberg School of Public Health, ²Department of Health, Behavior and Society, Johns Hopkins Bloomberg School of Public Health, ³Violence Prevention Research Program, University of California, Davis, ⁴Department of History of Medicine, Johns Hopkins School of Medicine, ⁵Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health

Statement of Purpose: Quantitative intersectional analysis is a burgeoning analytic approach in the public health field. However, limited research has used this approach to examine spatial inequities in firearm violence. We investigated the intersectional contribution of two forms of structural racism on firearm violence in Baltimore City. **Methods/Approach:** We performed an ecological cross-sectional study of 149 census tracts in Baltimore from 2015-2019. For each tract, we determined scores for two forms of structural racism 1) historic redlining grade and 2) contemporary racialized economic segregation. The redlining and segregation scores were dichotomized into binary variables with two categories signifying the tracts' level of disadvantage or advantage. We geocoded and aggregated individual incidents of fatal and nonfatal shootings to the tract level. We used an intersectional measure called the Attributable Proportion (AP) to describe the proportion of firearm violence that can be explained by the intersection of redlining and segregation. **Results/Conclusion:** In sustained disadvantage census tracts (tracts that were both historically redlined and experience contemporary socioeconomic disadvantage) almost half (49%) of all fatal shootings can be explained by the intersection of redlining and segregation; this is in comparison to 38% of nonfatal shootings and 41% of total shootings. The intersection of redlining and segregation explained approximately 650 nonfatal shootings and 370 fatal shootings in Baltimore's sustained disadvantage tracts. **Innovation & Significance to Field:** Intersectional measures can elucidate the varying extent that forms of historical and current oppression impact firearm violence. The intersectional contribution of structural racism on firearm violence was highest for fatal shootings. Ideas on violence prevention approaches are currently being contested. Our research suggests that structural racism is a fundamental cause of firearm violence inequities. To adequately address this root cause, policymakers should prioritize public health approaches to violence prevention that 1) centers health equity and racial justice and 2) promote large social and financial investments in sustained disadvantaged neighborhoods.

Session 9: Examination of firearm policies and their effects on firearm injuries

Capital Room, December 1, 8:30-10:00 AM

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1. Consumer Handgun Purchase Depends on Geographic Proximity to Storefront Gun Retailers

Adam M. Rosenberg BA¹,

¹*Department of Economics, Stanford University*

Statement of Purpose: Understanding supply and demand for consumer firearms may help develop effective gun policy. I study the elasticity of consumer gun purchases (demand) to changes in the number of storefront gun retailers operating nearby (supply). I consider repeat purchasers who account for most gun transactions and first-time buyers whose risks of injury change most following gun purchase. **Methods/Approach:** I assemble transaction-level data that links 4 million legal consumer handgun purchases to 1,000 storefront gun retailers in California 2005–2015. I estimate how consumer gun purchasing responds to the number of gun retailers operating at different geographic distances using (i) individual-level linear probability models and (ii) zip code-quarter panel regressions. Estimates are based on the entry and exit of 600 gun retailers. **Results/Conclusion:** Individual handgun purchase decisions respond to local supply. One additional retailer in a consumer's home zip code increases their probability of purchasing a handgun by 5 percent. The effect decays with distance and is near zero for retailers just 5 miles away. In aggregate, the entrance of a new gun retailer into a zip code increases the number of gun purchases within that zip code by 30 percent, due to transactions with the entrant. Gun retailer exits have the opposite effect. Aggregate effects persist for at least two years. Across all analyses, I find that first-time and repeat handgun buyers respond similarly to the supply of local gun retailers. **Innovation & Significance to Field:** Economic forces affect patterns of gun ownership. I show that demand for handguns is elastic to the operation of gun retailers. This elasticity suggests that changes in gun market policies may affect consumer gun ownership. The elasticity of first-time buyers suggests that altering the gun market may alter risks of firearm injury. Policies such as Chicago's 2010–2014 gun store ban may decrease gun injury through this mechanism.

2. Ghost gun policy: State and federal variation, limitations, and new developments

Alexander D. McCourt JD PhD MPH¹,

¹*Center for Gun Violence Solutions, Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health*

Statement of Purpose: The number of ghost guns—privately made, non-serialized guns that can be constructed from kits or standalone parts—reported to the Bureau of Alcohol, Tobacco, Firearms and Explosives has increased ten-fold since 2016. In response to this dramatic increase, state and federal officials have enacted policies that seek to regulate ghost guns. This study seeks to comprehensively categorize and analyze state and federal ghost gun policies and discuss the implications for enforcement and gun violence. **Methods/Approach:** State laws and regulations governing ghost guns were identified through primary legal research using Thomson Reuters Westlaw and state-specific websites. For each state, relevant definitions, requirements, and prohibitions were identified. State policies were characterized and analyzed with respect to other state gun policies, the ATF's final rule on privately made firearms, enforcement mechanisms, and potential incidental effects. **Results/Conclusion:** As of June 2022, there are 10 states and the District of Columbia that regulate ghost guns. State approaches to regulating ghost guns vary, with some states banning the sale of kits containing non-serialized parts and some states banning possession of untraceable guns. The federal rule clarifies definitions and manufacturing requirements in an effort to limit the availability of non-serialized parts. In concert, the federal rule and state legislation may work to limit the availability of ghost guns, but there are important limitations, including enforcement barriers, 3d-printed guns, and limited data. **Innovation & Significance to Field:** This is the first study to comprehensively examine policies that seek to regulate ghost guns. This study highlights the policy options that currently exist, but underlines the scarcity of ghost gun data, in particular, as a problem that needs to be addressed for researchers and practitioners in the field to assess whether and how these policies affect gun violence and whether these policies are enforced equitably.

3. Community-level impact of social policies surrounding firearm injury

Arielle C. Thomas MD MPH MS^{1,2}, Jehannaz Dastoor BA³, Angie Jang³, John D. Slocum MPH⁴, Sheila Regan MSW⁵, LeVon Stone Sr.⁵, Joseph Richardson PhD⁶, Maryann Mason PhD⁷, Julie K. Johnson PhD MPH⁴, Anne M. Stey MS FACS⁴

¹American College of Surgeons, Chicago, IL, ²Medical College of Wisconsin, Milwaukee, WI, ³Northwestern University, Chicago, IL, ⁴Department of Surgery, Feinberg School of Medicine, Northwestern University, Chicago, IL, ⁵Acclivus Inc, Chicago, IL, ⁶Department of African American Studies, University of Maryland, College Park, MD, ⁷Department of Emergency Medicine, Feinberg School of Medicine, Northwestern University, Chicago, IL

Statement of Purpose: Research evaluating the impact of social and community policies on firearm injury is growing but often done from the lens of quantitative research that is unable to consider the full breadth of the population needs. Few studies have evaluated the impact of social and community-level interventions on the population intended to be served. **Methods/Approach:** I will summarize two key studies evaluating the impact of community level interventions on firearm injury. For the first study, we conducted semi-structured interviews with 20 representatives from 13 community-based organizations (CBOs) in Chicago. Interviews were coded and analyzed thematically using a mixed inductive and deductive approach. The second study included a contemporary sample of studies that evaluated the gap between provided services of violence intervention programs (VIPs) and the needs of their population served. I will illustrate how social, political, and economic policies impact this population. **Results/Conclusion:** Lack of positive social infrastructure, poverty, and unstable funding mechanisms were central themes of social realities leading to spikes in gun violence. CBOs highlighted lack of funding for VIPs as a precursor to violence along with a strained relationship with the criminal justice system. Participants described a pervasive disengagement from police and mistrust in the justice system, leading victims and families to seek justice through extra-judicial means. For the second study, there were 12 studies relevant for inclusion representing 5 distinct VIP programs. The needs of their population included education attainment, employment, family/medical/mental health, and navigating legal or housing systems among others. Successfully meeting needs such as court advocacy, housing, and employment all significantly predicted whether a person would suffer future reinjury. **Innovation & Significance to Field:** Understanding how social policies affect individuals at the community-level creates potential targets for successful interventions. More rigorous evaluation of VIPs is needed of their services provided and the needs of the population being served.

4. Permit-to-Purchase Laws and Firearm Deaths Among Adolescents and Emerging Adults

Cassandra K. Crifasi PhD MPH¹, Rachel Topazian¹, Alex D. McCourt JD PhD MPH¹, Mitchell L. Doucette PhD MS¹, Daniel W. Webster ScD MPH¹

¹Center for Gun Violence Solutions, Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health

Statement of Purpose: Permit-to-Purchase (PTP) laws have previously been associated with reductions in the availability of guns for use in crime and firearm homicide. Research has also examined the role of firearm-related laws on shootings by police. Possession of firearms by civilians in interactions with police has important implications for shootings by police. To date, the potential impacts of PTP laws on shootings by police have not been examined. **Methods/Approach:** We accessed counts of fatal and nonfatal shootings by police from the Gun Violence Archive from 2014-2020, indexed by state-semester. Given the short period of available data, we conducted a cross-sectional analysis of PTP laws and shootings by police controlling for other firearm laws (e.g., concealed carry weapons laws) and state-level demographic characteristics. We used Poisson regression with robust standard errors and a population offset to produce incidence rate ratios (IRR). **Results/Conclusion:** PTP laws were associated with a 38% lower rate of shootings by police (IRR=0.62, 95% CI: 0.55-0.70). Compared to May Issue concealed carry weapons laws, Shall Issue (IRR = 1.34, 95% CI: 1.20-1.62) and Permitless carry (IRR=1.76, 95% CI: 1.46-2.11) were associated with higher rates of shootings by police. Stand Your Ground laws, comprehensive background checks in the absence of PTP, and extreme risk protection orders were not associated with shootings by police. Violent misdemeanor prohibitions were associated with a 17% increase (IRR=1.17, 95% CI: 1.06-1.29). **Innovation & Significance to Field:** Findings from this study add to the growing body of research finding that PTP laws are

beneficial to public safety by reducing multiple forms of violence. While efforts should be focused on improved police training and meaningful reform, PTP laws are an additional strategy for policymakers looking to address shootings by police.

5. Lessons from the outliers: firearm law and firearm dealer exposure in counties with unexpected changes in firearm homicides, 1989-2019

Jamie Song MPH¹, Michelle Degli Esposti PhD^{2,3,4}, Douglas J. Wiebe PhD⁵, Elinore J. Kaufman MD MSHP¹

¹*Division of Traumatology, Surgical Critical Care, and Emergency Surgery, University of Pennsylvania Perelman School of Medicine*, ²*DOVE Research Centre, Federal University of Pelotas, Brazil*, ³*Penn Injury Science Centre, Perelman School of Medicine, University of Pennsylvania, US*, ⁴*Department of Social Policy & Intervention, University of Oxford, UK*, ⁵*Department of Biostatistics, Epidemiology and Informatics, University of Pennsylvania Perelman School of Medicine*

Statement of Purpose: We previously compared firearm homicides in US counties in 2015-2019 to those in 1989-1993 to identify high and low outlier counties that showed unexpected deteriorations and improvements over time. We now hypothesize that low outlier counties are found in states with more restrictive firearm laws and fewer firearm dealers compared to high outlier counties. **Methods/Approach:** Firearm laws were drawn from the RAND State Firearm Law Database. County-level counts of federally licensed firearm dealers were drawn from the Bureau of Alcohol, Tobacco, and Firearms for 1993 and 2019. We calculated the number of laws and years each county was exposed to 19 types of firearm policies. High, low, and non-outlier counties were compared on years of law exposure using the Kruskal-Wallis rank test and Dunn's pairwise comparison test. **Results/Conclusion:** There were 63 high outlier counties, 14 low outlier counties, and 3,033 non-outlier counties. Firearm law exposure was similar across county groups. High outlier counties had a median of 0 (0-8.42) law-years of open carry prohibition compared to 8.42 (8.42-19.67) for low outliers ($p=0.07$) and 8.42 (7.92-13.08) for non-outliers ($p=0.004$). Low outlier counties had a median of 22.5 (12-35) firearm dealers in 1993 and 6.5 (5-9) in 2019. High outliers had 31 (18-61) firearm dealers in 1993 and 10 (4-17) in 2019 for an average decrease of 22 (11-35). Non-outliers had 38 (21-78) firearm dealers in 1993 and 12 (6-23) in 2019. **Innovation & Significance to Field:** Counties with unexpectedly large increases in firearm homicides had similar law exposure, with the greatest difference relating to open carry prohibitions. Low outlier counties had fewer firearm dealers, but a smaller decrease in dealers compared to other counties. These factors may partially explain county-level outlier status, though additional local environmental, social, cultural, and political factors also deserve further investigation.

6. U.S. Firearm Trafficking to Central America: Sources and Impacts

Mark Ungar PhD¹

¹*Doctoral Program of Criminal Justice, John Jay College-Graduate Center, City University of New York*

Statement of Purpose: The purpose of this paper is to create a policy framework to document, address, and understand the impact of the flow of US firearms to Northern Central American (NCA) countries of Guatemala, El Salvador, and Honduras. Those three countries have the three of the world's highest rates of crime, which are a chronic source of political instability and mass migration to the US. **Methods/Approach:** This presentation's three-level mixed methods approach centers on a combination of a quantitative and qualitative analysis. First, it brings together seven core datasets on firearms: US sources of private firearms to NCA (by state and manufacturer); illegal arms detected and seized at customs; types of arms registered by NCA agencies; firearms sold through private channels in NCA; artisanal weapons manufactured in the NCA; crime scene weapons that are traced; and rates of firearm crime prosecution and convictions. Second, it qualitatively assesses the capacities of main agencies that produce this data: the Bureau of Alcohol, Tobacco, Firearms and Explosives; Customs and Border Patrol; Homeland Security Investigations; NCA registration agencies; and NCA judiciaries. Third, it will incorporate analysis of the sources of demand in the NCA: citizens, corrupt officials, the two maras (MS-13 and Barrio 18), and drug-trafficking organizations. **Results/Conclusion:** The conclusion is that firearms trafficking from the US to Central America is centered on a mutually reinforcing set of partially analyzed political, criminal, and socio-economic circumstance, worsened by the lack of objective and updated data. **Innovation & Significance to Field:** No comprehensive study has been conducted of the full cycle of US arms to Central America. This will be the first to

map out the entire network of trafficking by compiling data; assesses the capacity of agencies responsible for providing data and controlling illegal arms; and incorporating the region's sources of demand.

7. Quantifying the effectiveness of firearm policies in reducing firearm harms using information theory

Roni Barak Ventura PhD¹, Maurizio Porfiri PhD¹

¹Center for Urban Science and Progress, New York University Tandon School of Engineering

Statement of Purpose: Firearms pose a serious public health threat in the US, where the number of fatalities by firearms exceeds motor vehicle fatalities. In spite of these unsettling figures, Americans still seek to hold guns for protection of their homes and families. In order to prevent firearm-related harms without limiting citizens' right to bear arms, one must identify the policies that most effectively reduce firearm harms. To this end, we investigate the causal relationships between firearm prevalence, firearm harms, and firearm laws within an information-theoretic framework. **Methods/Approach:** For each US state, we collected the monthly number of firearm background checks registered by the FBI and the monthly numbers of homicides and suicides committed with firearms reported on CDC's Wonder database. We also collated data about firearm-related laws from RAND's State Firearm Law Database. We computed transfer entropy to infer causal links from firearm acquisition to homicides and suicides, and tested whether the implementation of certain firearm laws disrupted those causal links. **Results/Conclusion:** We identify several states in which there are causal links between firearm prevalence and firearm harms and detail the strength of these associations. We also pinpoint the specific legal environments that moderate these associations. Our analysis suggests that certain sets of laws are more effective than others in reducing firearm harms in different states, offering evidence that distinct legislative approaches should be taken as a function of the specific geographic region. **Innovation & Significance to Field:** This analysis serves as a stepping stone for causal analysis of firearm laws and could provide initial guidance for future legislation to effectively reduce regional firearm harm rates.

Session 10: Criminal justice and firearm crime

Congressional Rooms, December 1, 10:15 -11:45 AM

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1. The relationship between firearm theft and criminal use

Hannah S. Laqueur PhD MA MPA^{1,2}, Garen J. Wintemute MD MPH^{1,2}, Christopher McCort MS^{1,2}

¹University of California, Davis, Department of Emergency Medicine, ²Violence Prevention Research Program, University of California Firearm Violence Research Center

Statement of Purpose: Using a unique constellation of California datasets including statewide local law enforcement records of crime-involved firearms (“crime guns”), firearms reported stolen, and legal purchasing records, this study examines the flow of firearms from the licit to the illicit market and the relationship between firearm theft and criminal use. **Methods/Approach:** We describe temporal and geographic trends in purchasing, theft, and crime gun recovery from 2010-2020. We link firearms reported stolen to legal transaction and crime gun recovery records to trace the “life course” of the gun. We will implement multistate models to model the movement of firearms from last retail sale (if available) to theft to potential recovery in association with a crime or reappearance in a sale (e.g. at a pawn shop). **Results/Conclusion:** During our study period, legal handgun purchases more than tripled, from 147,365 to 491,592 yearly. The number of recovered crime guns grew from 24,657 to 39,315 per year. Stolen firearm reports ranged from 9,094-12,533, peaking in 2016, despite a 2017 law requiring owners report stolen weapons. This decline may represent a substitution from theft to privately-manufactured unserialized firearms. Approximately 7% of recovered crime guns had previously been reported stolen. The median time between theft and recovery was less than one year (257 days). Among stolen firearms, the chance of recovery within the year grew from 5% in 2010 to 8% by 2020. 15% of stolen firearms were recovered by the end of the study period. **Innovation & Significance to Field:** Other than at the local level, there are few systematic data on crime-involved firearms and their movement from on-the-books sale to criminal end user. This is the first study to analyze California’s statewide compilation of crime gun and stolen firearm data. It contributes to our understanding of the role of theft in supplying firearms to perpetrators of crime and violence.

2. Rising Gun Thefts from Cars and Associated Factors

Megan J. O’Toole PhD¹, Jay Szkola¹, Sarah Burd-Sharps¹

¹Everytown for Gun Safety Support Fund

Statement of Purpose: Gun thefts from cars pose major safety risks across the country, as they divert guns away from the legal market and increase the likelihood that they will be involved in future crimes of violence. But recent research on trends in gun thefts from cars and contributing factors is limited. **Methods/Approach:** This study analyzes longitudinal trends in a decade of NIBRS data from 149 cities, and cross-sectional recent trends in 271 cities, using descriptive statistics and regression models. Negative binomial and poisson regression models analyze the impacts of gun violence prevention policies (e.g., secure storage, permitless carry, lost and stolen reporting, and minimum ages) on gun thefts from cars, controlling for factors such as local gun ownership, demographics, law enforcement agency size, and crime rates. **Results/Conclusion:** Results reveal that gun thefts from cars increased twofold over the past decade; are the primary source of stolen guns; consistently come from cars parked outside of homes; and are associated with the absence of state-level gun violence prevention policies. **Innovation & Significance to Field:** Implications for public safety strategies, public education and awareness campaigns, and gun violence prevention policies are discussed. Secure storage and lost and stolen reporting are emphasized.

3. Assessing the Impact of Plea Bargaining on Subsequent Violence for Firearms Offenders

Brian D. Johnson PhD¹, Kiminori Nakamura PhD¹, Raquel Hernandez M.A. PhD Candidate¹

¹Criminology & Criminal Justice, University of Maryland

Statement of Purpose: Firearms violence is a major policy concern in America. How criminal courts address firearm

crimes represents a critical opportunity for preventing future violence. The overwhelming majority of criminal cases are settled by plea bargaining; yet, little is known about how plea deals impact punishment or shape recidivism. This study investigates the impacts of plea bargaining on sentencing and recidivism outcomes for firearms-involved offenders. It examines the overall scope of plea bargaining, and its impacts on subsequent punishment and reoffending. **Methods/Approach:** The study develops detailed measures of plea discounts and examines their effects on sentencing and recidivism outcomes in firearms cases. It analyzes multiple data sources, including police arrest data, judicial case processing data, and recidivism data, for a cohort of offenders arrested for firearms offenses and convicted in Maryland criminal courts between 2019 and 2020. The study calculates the “distance traveled” in plea bargaining, or the extent to which charging changes affect sentence severity. Utilizing multiple regression techniques, it then investigates how sentence reductions impact recidivism, including re-arrests and re-convictions for firearms-involved and other violent crimes. **Results/Conclusion:** Results demonstrate that plea-bargaining is common for firearms-related offenses and that charge reductions in these cases result in significant discounts in criminal sentences for gun-involved offenders. The impacts of reduced charges on patterns of violent recidivism are less clear and suggest more work is needed on this important topic. **Innovation & Significance to Field:** Plea bargaining is likely to impact both sentencing and recidivism. Reduced sentences may diminish specific deterrence and incapacitation effects and lead to increases in crime. This study analyzes unique state-wide data, employs an innovative method for capturing the “distance traveled” in plea bargaining, and demonstrates how charge reductions can lead to lesser punishments and potentially more crime, which has clear public safety implications.

4. Gun Crimes in the Connected States of America: Flow through the Iron Pipeline

Christopher N. Morrison PhD¹, Ariana N. Gobaud MPH¹, Christina A. Mehranbod MPH¹, Brady Bushover MPH¹, Maerk Hoofnagle MD PhD²

¹Department of Epidemiology, Mailman School of Public Health, Columbia University, ²Department of Surgery, Washington University in St. Louis

Statement of Purpose: State gun control laws can reduce gun crime by limiting supply to people at risk of committing a crime. Illegal gun transfers across state lines undermine these laws. The aim of this study was to identify possible trafficking routes along US interstate highways. **Methods/Approach:** This geographic network analysis used Firearms Trace Data for 2010-2021, compiled by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF). The ATF publishes annual reports documenting guns that were used in crimes for each state, including the state in which the gun was first purchased from a retail outlet and the time elapsed between the purchase and the crime. A valued directed network graph represented the count of gun transfers (edges) between the 48 contiguous states (nodes). Exponential random graph models estimated gun transfer counts compared to the expected flow based on node population size, edge distance, and network structure. Edge-level independent measures were US interstate highway routes. **Results/Conclusion:** A total of 2,173,605 traceable guns were used in crimes in the 48 states from 2010-2021, including 604,726 (27.8%) traced to interstate purchases and 409,494 (18.9%) used within one year of their retail purchase. Absolute flow was greatest from Arizona to California (18,342 guns), Indiana to Illinois (14,563 guns), and Nevada to California (12,375 guns); relative flow was greater than expected along edges corresponding to northbound I-95 (i.e., from Florida to Maine and all edges along that route) and westbound I-94 (Michigan to Montana). Associations were stable over the 12 years. For guns used in crimes within one year of purchase, associations were strongest along westbound I-94. **Innovation & Significance to Field:** Interstate transfers—including rapid transfers within one year—contribute substantially to the supply of guns used in crimes through multiple stable “iron pipelines”. Reducing gun crime requires cooperation between states.

5. Research on a 15-Year Statewide Program to Generate Enhanced Investigative Leads for Crime Gun Violence

David E. Lambert PhD¹, Glenn L. Pierce PhD², Pete Gagliardi³, Daniel Trovato²

¹School of Justice Studies, Roger Williams University, ²School of Criminology and Criminal Justice, Northeastern University, ³Consultant

Statement of Purpose: This presentation examines the innovative use of firearms related evidence to enhance violent crime investigations in New Jersey. The study integrates firearms evidence, particularly shootings event

information, ballistics imaging and crime gun tracing with intelligence analysis to provide investigators with new avenues of lead generation. This research is the first formal assessment of this unique statewide collaboration and information sharing effort. **Methods/Approach:** The study is a mixed methods approach to policy analysis using both quantitative and qualitative analysis. The researchers' analyzed ballistics imaging submissions over a multi-year period in addition to examining open source and agency documents that tracked many of the crime reduction projects the New Jersey State Police incorporated into their crime gun intelligence effort. **Results/Conclusion:** This effort changed the use of firearms forensic evidence from a primarily prosecutorial focus to incorporate this evidence for use in generating investigative leads. This project demonstrated the fusion of firearms forensic evidence such as ballistics imaging with arrest and incident data on a statewide basis. Demonstrated the use of ballistics imaging to connect, previously unconnected incidents, individuals, and weapons. **Innovation & Significance to Field:** While major urban police agencies conduct crime gun intelligence programs, this New Jersey project was a statewide, multi-jurisdictional effort. The New Jersey State Police initiated this project in 2006 as part of a comprehensive crime reduction strategy. Unlike similar firearms violence strategies, over a 15- year period this project evolved into a program of the ongoing initiatives that often produced short-term wins that also incrementally changed the business processes and investigative culture within participating agencies. It illustrated the utility of information sharing entities such as fusion and real time crime centers in supporting violent crime suppression efforts. Finally, it illustrates how business process improvement could address seemingly intractable resource limitations.

6. Correlates of firearms recovered in crimes: A descriptive analysis of 8,528,166 firearms

Sonia L. Robinson PhD MPH¹, Chris McCort MS¹, Colette Smirniotis PhD¹, Garen Wintemute MD¹, Hannah Laqueur PhD¹

¹Violence Prevention Research Program, UC Davis

Statement of Purpose: Our aim is to identify buyer, seller, transactions, and firearm characteristics associated with the timing and occurrence of firearm recoveries following crimes in California from 2000-2021. Correlates examined to-date include transaction and firearm characteristics. **Methods/Approach:** We linked data on firearms recovered by law enforcement ("crime guns") with sales records from the California Department of Justice's Automated Firearm System. The sales records (Dealer Record of Sales) contain information on retailer, purchaser, and firearm characteristics. Long guns are included from 2014-2021. Median time from last purchase to recovery in a crime was calculated. We then compared characteristics of firearms that were recovered in a crime versus firearms that were not using percentages. **Results/Conclusion:** This analysis included 12,742,455 transactions and 8,528,166 firearms. In total, 67,849 (0.80%) firearms were recovered following crimes. Median time-to-crime was 2.44 years (interquartile range 0.93-5.35). Compared with firearms not recovered in a crime, crime guns were more likely to have ≥5 transactions (14.85 v 0.93%), be pawned (1.23 v 0.47%), be redeemed at a pawn shop (1.67 v 0.47%), and be stolen (13.98 v 0.55%). Crime guns were less likely to have been registered as having a CCW license (0.13 v 0.67%). Type of firearm varied as well: since 2014, compared to firearms not recovered in crimes, crime guns were more likely handguns (80.90 v 52.94%) than long guns (19.10 v 47.06%). **Innovation & Significance to Field:** In future analyses, we will identify characteristics of the retailer, purchaser, and retailer location associated with crime gun recovery and "short time-to-crime" (<3 years). Then, we will use survival analysis to identify key risk factors associated with firearm recovery and short time-to-crime. When completed, this comprehensive analysis will provide law enforcement agencies and policy makers with empirical data to identify key risk factors associated with criminal gun use.

Session 11: Enhancing the firearm data infrastructure through innovative data and methods (Part II)

Capitol Room, December 1, 10:15-11:45 AM

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1. CDC's Vital Signs on Changes in Firearm Homicide and Suicide Rates – United States, 2019-2020

Thomas R. Simon PhD^{1,2}, Alberto Santana MS^{1,2}

¹Centers for Disease Control and Prevention, ²National Center for Injury Prevention and Control, Division of Violence Prevention

Statement of Purpose: The CDC's Vital Signs serves as a high-profile platform for the CDC director to highlight important health topics. In May of 2022, the CDC released the first Vital Signs focused on firearm deaths. This session will describe the results and the steps CDC took to disseminate key findings and raise awareness about firearm deaths and prevention opportunities. **Methods/Approach:** The Vital Signs included a Morbidity and Mortality Weekly Report (MMWR) article that described changes in firearm homicide and suicide rates coinciding with the emergence of the COVID-19 pandemic. In addition, the Vital Signs involved multiple communications products and dissemination strategies, including a webpage, media telebriefing, social media, and partner engagement. **Results/Conclusion:** The study found that 79% of all homicides and 53% of all suicides in 2020 involved firearms. From 2019 to 2020, the firearm homicide rate increased nearly 35%, resulting in the highest firearm homicide rate in more than 25 years. Firearm homicide rates increased across the country and in both metropolitan and rural areas. The firearm suicide rate remained relatively stable and near record levels. The study described the widening of longstanding inequities, with particularly high increases in firearm homicide among the non-Hispanic Black population and firearm suicide among the non-Hispanic American Indian/Alaskan Native population. The MMWR article and communication materials described the underlying inequities that contribute to disparities, potential reasons for the increases, and opportunities for prevention. **Innovation & Significance to Field:** The intensive dissemination efforts and critical messages about firearm deaths being a significant and growing public health problem, widening disparities, and the importance of a comprehensive approach to prevention resulted in substantial media coverage. Nearly 100 media outlets participated in the press briefing. In the first 15 days, the report garnered over 1,500 news stories with an estimated reach of over 1.5 billion potential audience views/engagement based on standard media metrics.

2. The Functional Synthetic Control Method: A Generalization of the Synthetic Control Method for Functional Data

Aaron B. Shev PhD¹, Chris McCort MS¹, Andre Farris PhD², Veronica Pear PhD, MPH, MA¹, Rose Kagawa PhD, MPH¹, Hannah Laqueur MA MPA¹

¹Violence Prevention Research Program, Department of Emergency Medicine, School of Medicine, University of California, Davis, ²Department of Statistics, University of California, Davis

Statement of Purpose: We propose a novel approach to the Synthetic Control Method (SCM) by adapting SCM to a functional data setting by applying Principal Analysis by Conditional Expectation. The SCM is traditionally used to estimate the effect of a treatment on a single unit in the panel data setting and has become an increasingly important method for observational studies over the past decade. By taking a functional data approach to the SCM, many of its shortcomings can be addressed. **Methods/Approach:** We adapted the SCM to a functional data setting by applying functional principal components analysis through PACE to panel data. This setting treats units in the panel data as smooth, continuous functions that are observed with measurement error providing a denoising step prior to identification of a control. A synthetic control is fit by finding weights to minimize the distance in principal component scores as opposed to user-selected functions of pre-intervention outcomes. Additionally, we provide a method to construct asymptotic confidence intervals for the functional synthetic control effect estimate. **Results/Conclusion:** In a Monte Carlo simulation using simple random generated panel data, the functional synthetic

control method reduced MSE for pre-intervention fit by 7% compared to SCM and reduced the MSE in estimating the true intervention effect by more than 65% when data were noisy. **Innovation & Significance to Field:** Our proposed generalization of the synthetic control method to the functional data setting addresses long-standing issues of user-bias and poor fit from noisy data as well as adapting the method to work when data is missing or collected using alternative sampling schemes. This opens possibilities for estimating the effects of policies when standard methods may not be applicable.

3. Comprehensive Local Surveillance of Pediatric Firearm Injuries to Identify Vulnerable Populations and Risk Factors for Injury Prevention Planning: The Greater Houston Model

Bindi Naik-Mathuria MD MPH FACS FAAP¹, Cary Cain PhD¹, Ned Levine PhD², Abi Oluyomi PhD³, Lisa Pompeii PhD³, Elsa Benavides BS⁴, Marie Kasabaum BS⁴

¹Baylor College of Medicine, Department of Surgery, Pediatric Surgery and Trauma, ²Ned Levine & Associates, ³Baylor College of Medicine, Department of Medicine, Epidemiology and Public Services, ⁴Baylor College of Medicine, Department of Pediatrics, Research

Statement of Purpose: Injury from firearm is the leading cause of death in U.S. children. Non-fatal injuries and risk factors are not well-known. Comprehensive local surveillance is critical to inform community-based injury prevention efforts. **Methods/Approach:** A linked integrated database of pediatric fatal and non-fatal firearm injuries was developed from trauma centers, medical examiner office, and police records in a large urban county during 2018-2020. Descriptive statistics, multinomial logistic regression, and geospatial methods were used for analysis. **Results/Conclusion:** Of 485 pediatric firearm injuries, 84% were male and 70% were 15-17y. Assault was the most prevalent intent (54%), followed by unintentional (19%), bystander (9%), and suicide/self-harm (6%). Non-fatal injuries were 3 times more common than fatal. Firearm injuries rose 76% between 2018-2020. Compared to children injured by assault, those with unintentional injuries were more likely to be younger (OR:0.16, p<.001), White non-Hispanic vs Black (p<.001), and no significant difference in gender. Those with self-harm injuries were more likely to be female (OR:1.24, p=.02), White non-Hispanic vs Black (OR:3.37, p<.001), have a mental health disorder (OR: 1.59, p<0.001), and no significant difference in age. Overall, 83% had public/no insurance (n=411), 39% lived in apartments (n=439), 52% had single parent households (n=349), and 30% had history of interpersonal violence (n=350), most notably in self-harm injuries (43%). 93% of suicides and 83% of unintentional injuries occurred by family firearms found in homes or cars (n=435). Assault and bystander shootings occurred in similar locations in urban areas, suicides in suburban/rural areas, and unintentional shootings in both. Pediatric and adult crime “hot spots” were similar. These data can inform targeted injury prevention efforts through socioecological models for each shooting intent. **Innovation & Significance to Field:** Local surveillance including all firearm injuries, sociodemographic, and neighborhood-level risk factors can accurately define the problem and inform effective targets for injury prevention.

4. Understanding Risk Factors for Non-Injurious, Injurious Non-Fatal, and Fatal Gun Violence Victimization Using a Comparative Approach

Brendan Lantz PhD¹, Marin R. Wenger PhD¹, Emma E. Fridel PhD¹

¹Florida State University, College of Criminology and Criminal Justice

Statement of Purpose: Gun violence, while often characterized as a singular issue, is not one cohesive problem; instead, it takes many forms, resulting from the complex interplay of multiple factors operating jointly and across different contexts (e.g., school vs community violence). Outcomes of gun violence may also differ, in that they may be (a) physically non-injurious (i.e., a gun is brandished); (b) injurious but non-lethal; or (c) lethal. Following this, our research contends that it is essential to consider the individual, situational, and contextual risk factors for both non-lethal and lethal gun violence victimization within a comprehensive, comparative framework. **Methods/Approach:** We compile a large-scale national-level database including more than one million incidents of non-lethal (both injurious and non-injurious) and lethal gun violence. We then use multivariate regression models at both the community and individual level to examine variation in the frequency and likelihood of gun violence victimization outcomes (e.g., non-injury vs. injury, injury vs. death) according to a host of individual, situational, and

contextual factors. **Results/Conclusion:** Our results reveal important variation in the risk factors associated with different forms of gun violence, such that there are important risk factors specifically associated with non-lethal gun violence, specifically associated with lethal gun violence, and associated more generally with both. Taken together, these results suggest that failing to account for this variation may result in a mischaracterization of gun violence as a whole; understanding this variation—especially regarding modifiable risk factors—also has critical implications for policy intervention efforts. **Innovation & Significance to Field:** Based on our findings, we present a novel theoretical interactionist framework for better understanding gun violence—and developing policy responses to this violence—which disaggregates gun violence into its various forms and proposes a conceptualization of risk factors into discrete categories, each with important implications for policy intervention.

5. Learning About Firearm Behavior and Firearm-Related Outcomes Using Social Media Data

Carole Roan Gresenz PhD¹, Lisa O. Singh PhD²

¹McCourt School of Public Policy and Department of Health Systems Administration, Georgetown University,

²Department of Computer Science and Massive Data Institute, Georgetown University

Statement of Purpose: Historic constraints on research dollars and data availability have consequently limited firearms research. Recently, interest in the power and potential of social media analytics, particularly in health contexts, has surged. Our goal is to assess how social media data may contribute to firearms research either in conjunction with or as a supplement to traditional data sources. **Methods/Approach:** We examine the value of social media data for estimating a firearm behavior (gun ownership) and a firearm-related outcome (firearm mortality) for which benchmark data are available from traditional sources. We construct state-level firearm ownership estimates from Twitter data for 34 U.S. states and estimate the volume of Twitter firearm fatality discussions by month for a subset of 24 U.S. states. We calculate the Pearson's and/or Spearman's rank correlations between our Twitter-based estimates and benchmark estimates for firearm ownership and firearm fatalities. **Results/Conclusion:** We find a moderate to strong positive correlation between Twitter-based estimates of gun ownership and benchmark ownership estimates and moderate correlation between month-to-month changes in firearm fatalities discussed in Tweets compared to firearm fatalities measured using a traditional source. Our findings suggest that Twitter data contain a meaningful information signal for understanding firearm-related outcomes and firearm behaviors. **Innovation & Significance to Field:** These findings point to the value social media data are likely to hold as a tool for providing insight into dimensions of firearms behavior and firearms-related outcomes that are not currently measured, not measured well, or not measurable through other traditional sources. This research provides an important building block for future work that continues to develop the usefulness of social media data, alone or in conjunction with other data resources, to strengthen the information base on which firearm research relies.

6. County-Level Variation in Changes in Firearm Mortality Rates across the United States, 1989-1993 to 2015-2019

Michelle Degli Esposti DPhil^{1,2,3}, Jason Gravel PhD⁴, Elinore Kaufman MD MSHP^{2,5}, M. Kit Delgado MD MS,^{2,5,6} Therese Richmond PhD RN FAAN^{2,7}, Douglas Wiebe PhD^{2,6}

¹DOVE Research Centre, Federal University of Pelotas, Brazil, ²Penn Injury Science Centre, Perelman School of Medicine, University of Pennsylvania, US, ³Department of Social Policy & Intervention, University of Oxford, UK, ⁴Department of Criminal Justice, Temple University, Pennsylvania, ⁵Division of Traumatology, Surgical Critical Care, and Emergency Surgery, Perelman School of Medicine, University of Pennsylvania, ⁶Department of Biostatistics and Epidemiology, Perelman School of Medicine, University of Pennsylvania, ⁷Biobehavioral Health Sciences Department, School of Nursing, University of Pennsylvania

Statement of Purpose: Firearm violence remains a critical public health challenge, disproportionately impacting some US regions. County-level variation may hold key insights into how firearm mortality rates vary across the nation. With NCGVR funding, we modelled county-level changes from 1989-1993 to 2015-2019 to identify and characterize geographical “hotspots” in firearm mortality rates. **Methods/Approach:** We used a novel small area estimation method to analyze restricted access mortality micro-data on causes of death by US county. Bayesian spatial models were used to map geographic variation in changes in age-standardized firearm mortality rates (per

100,000 person-years) from 1989-1993 to 2015-2019. County outliers (“hotspots”) were defined as having observed rates that fell outside the 95% credibility intervals of their expected posterior predictive distribution. Counties that showed unexpected changes over time were then visualized and characterized. **Results/Conclusion:** Between 1989 and 2019, 1,036,518 firearm deaths were recorded in US counties. Firearm suicide rates increased from 1989-1993 to 2015-2019 (mean change: 1.21; SD=6.91), while firearm homicide rates decreased ($M=-0.39$; SD=3.96). However, these national trends were not homogenous within states and often varied by geographic region. The mid and mid-west showed the most pronounced increases in firearm suicide rates, whereas the south-east showed localized increases in firearm homicide rates, despite the national decreasing trend. We identified critical “hotspots” in urban counties of Alabama, and firearm homicide rates (per 100,000) in Baltimore City almost doubled from 29.71 to 47.43, and by 2015-2019 it accounted for 67% of all firearm homicide in Maryland. By contrast, District of Columbia showed promising improvements over time, decreasing from 56.45 firearm homicides per 100,000 in 1989-1993 to 14.45 in 2015-2019. **Innovation & Significance to Field:** There was substantial variation in rates and changes in firearm deaths among US counties. Geographic hotspots may be useful to inform targeted prevention efforts and local policy responses.

Session 12: Examining economic and policy solutions and their effects on firearm injuries

Hampton Ballroom, December 1, 1:15 - 2:45 PM

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1. The U.S. Consumer Firearms Industry: Equilibrium and Implications for Gun Policy

Luis Armona PhD¹, Adam Rosenberg PhD Student²

¹Stanford University, Department of Economics, and NBER (Post-Doctoral Fellow), ²Department of Economics, Stanford University

Statement of Purpose: We study how supply and demand determine the allocation of guns across households in the contemporary U.S. Understanding the gun industry may help explain individual gun purchase and develop policy that mitigates harms from gun ownership. **Methods/Approach:** We collect data on gun prices from the Blue Book of Gun Values, gun characteristics from GunGenius.com, and gun sales quantities from a large online marketplace for consumer firearms and monthly NICS reports. We gather data on the size and ownership structure of gun manufacturers from yearly ATF reports and hand-collected information on acquisitions of the largest manufacturers. Linking these datasets generates gun-level information on prices, characteristics, consumer sales, and manufacturer ownership for 85 percent of the U.S. consumer firearm industry. We use methods from industrial organization to estimate consumer demand for guns in the U.S., as well as the pricing decisions of gun manufacturers.

Results/Conclusion: Preliminary evidence shows that guns vary widely in prices, depending on their characteristics, and merger activity in this sector has led to non-trivial price increases in firearms. Our model of firearm demand will reveal how consumers change purchase patterns when the price of their desired firearm changes, in particular, whether they substitute for other guns, or to not purchase a firearm at all. Our supply model will reveal to what extent gun manufacturers have latitude when setting prices, and how suppliers may respond to policy interventions.

Innovation & Significance to Field: Numerous policies may affect the decisions of gun manufacturers — antitrust enforcement, liability law reform, the current federal sales tax on guns, and restrictions on sales of assault-style weapons and high-capacity magazines. We produce an economic model of the gun industry in order to predict how these policies may affect gun manufacturers, the allocation of guns across households, and the risk of firearm-related in the contemporary U.S.

2. Finding the Common Ground in Gun Violence Prevention Policy

Michael Siegel MD MPH¹, Amani Dharani¹, Kathleen Grene¹

¹Department of Public Health and Community Medicine, Tufts University School of Medicine

Statement of Purpose: This research aimed to help bridge the seemingly intractable divide around gun violence prevention policy by identifying common ground and shared principles that could bring gun owners and non-gun owners together to support effective gun policies. We sought to: (1) ascertain gun owners' attitudes toward the principles that underlie potential gun violence prevention policies; (2) identify the detailed provisions of gun policies that determine whether gun owners will support those policies; and (3) develop a platform of effective gun policies likely to be supported by both gun owners and non-gun owners. **Methods/Approach:** To ascertain the attitudes of gun owners, we conducted a national internet-based survey of 1,078 adult gun owners. The survey was conducted by NORC at the University of Chicago using AmeriSpeak, a pre-recruited internet panel of approximately 50,000 adults throughout the U.S. The data were statistically weighted to produce nationally representative estimates.

Results/Conclusion: We found that there was a vast difference between gun owners' general support for gun safety policies and their support for specific laws that are under consideration. Gun owners' opinions regarding specific firearm laws was highly dependent on the detailed provisions of those laws. We concluded that gun owner support for major gun laws could be increased substantially by addressing their concerns about specific provisions of these laws. Based on these findings, we crafted a gun policy package that we believe is both effective and consistent with the identified common ground between gun owners and non-gun owners. **Innovation & Significance to Field:** This is the first national survey of gun owners to ascertain the values that underlie their opinions regarding gun policies. The

results of this study could help to promote a package of gun policies that is effective and will be supported by gun owners and non-gun owners alike.

3. Permit-to-Purchase Laws and Shootings by Police

Cassandra K. Crifasi PhD MPH¹, Julie A. Ward RN PHNA-BC¹, Alex D. McCourt JD PhD MPH¹, Mitchell L. Doucette PhD MS¹, Daniel W. Webster ScD MPH¹

¹Center for Gun Violence Solutions, Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health

Statement of Purpose: Permit-to-Purchase (PTP) laws have previously been associated with reductions in the availability of guns for use in crime and firearm homicide. Research has also examined the role of firearm-related laws on shootings by police. Possession of firearms by civilians in interactions with police has important implications for shootings by police. To date, the potential impacts of PTP laws on shootings by police have not been examined.

Methods/Approach: We accessed counts of fatal and nonfatal shootings by police from the Gun Violence Archive from 2014-2020, indexed by state-semester. Given the short period of available data, we conducted a cross-sectional analysis of PTP laws and shootings by police controlling for other firearm laws (e.g., concealed carry weapons laws) and state-level demographic characteristics. We used Poisson regression with robust standard errors and a population offset to produce incidence rate ratios (IRR). **Results/Conclusion:** PTP laws were associated with a 38% lower rate of shootings by police (IRR=0.62, 95% CI: 0.55-0.70). Compared to May Issue concealed carry weapons laws, Shall Issue (IRR = 1.34, 95% CI: 1.20-1.62) and Permitless carry (IRR=1.76, 95% CI: 1.46-2.11) were associated with higher rates of shootings by police. Stand Your Ground laws, comprehensive background checks in the absence of PTP, and extreme risk protection orders were not associated with shootings by police. Violent misdemeanor prohibitions were associated with a 17% increase (IRR=1.17, 95% CI: 1.06-1.29). **Innovation & Significance to Field:** Findings from this study add to the growing body of research finding that PTP laws are beneficial to public safety by reducing multiple forms of violence. While efforts should be focused on improved police training and meaningful reform, PTP laws are an additional strategy for policymakers looking to address shootings by police.

4. Deregulation of public civilian gun carrying and violent crime: A longitudinal analysis 1993-2019

Mitchell L. Doucette PhD MS¹, Cassandra K. Crifasi PhD MPH¹, Alex D. McCourt JD PhD MPH¹, Julie A. Ward MN RN, PHNA-BC¹, Rebecca L. Fix PhD MS², Daniel W. Webster ScD MPH¹

¹Center for Gun Violence Solutions, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, ²Department of Mental Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD

Statement of Purpose: As of 2022, twenty-five states no longer require a permit to carry a concealed firearm in public. While concealed carry weapons (CCW) laws have been a subject of much academic study, the impact of this recent deregulation effort remains unknown. **Methods/Approach:** We evaluated the impact of states moving from Shall-Issue to Permitless CCW laws from 1993-2019. We utilized augmented synthetic control models and random-effect, meta-analyses to estimate state-specific effects and an inverse variance weighted average of effects related to law adoption on rates of six violent crime outcomes and weapons-related arrests. We stratified our weighted average by whether Permitless CCW law adopting states required permittees to complete live firearm training as part of their prior Shall-Issue CCW law. **Results/Conclusion:** Rates of assaults, robberies, and homicides with a gun did not change in Permitless CCW law adopting states while rates of assaults and robberies committed with a knife decreased significantly. Permitless CCW law adopting states had significant lower rates of weapons-related arrests. Permitless CCW law adopting states that removed their live firearm training permit requirement had significantly more assaults with a gun compared to Permitless CCW law adopting states that never required concealed weapons carriers to undergo training. **Innovation & Significance to Field:** The adoption of Permitless CCW laws not leading to significant changes in gun violence suggests either that the overall number of civilians carrying concealed firearms has no net effect on gun violence or that moving from a Shall-Issue to a Permitless CCW law does not appreciably change civilian gun carrying practices. Increases in legal gun carrying following permitless laws may be greatest in states that previously required live firearm safety training to legally carry concealed firearms. Increased gun violence in these states after they went to Permitless CCW law suggests that live firearm safety training requirements suppressed gun violence.

5. The Gun Rights 2.0 Movement: Public Policy Consequences

Robert J. Spitzer PhD¹

¹*Political Science Department, State University of New York at Cortland*

Statement of Purpose: The purposes of this presentation are 1) to quantify the courts' rightward shift, founded in the judicial philosophy of constitutional Originalism, the core of which is fealty to history; and 2) to conduct a close historical examination of cases that are at the epicenter of the current Gun Rights 2.0 movement by employing the sort of historical analysis that is key to the Originalist paradigm. Policy cases examined include assault weapons, ammunition magazines, gun silencers, public gun brandishing and display, and the Second Amendment Sanctuary movement. **Methods/Approach:** The method employed is analysis of early gun laws, policies, habits, and practices. **Results/Conclusion:** The results of this analysis demonstrate that the goals of this Gun Rights 2.0 movement are contradicted the very history to which its Originalism claims fealty. **Innovation & Significance to Field:** This analysis excavates a formerly unknown, ignored, or distorted gun law history for each of the cases examined. The analysis belies the notion that regulation in these areas is a purely modern construct. Quite the contrary: government regulation of guns and gun-related practices is as old as guns themselves. History aside, contemporary efforts to expand gun rights and practices in these areas represent problematic public policy and counterproductive public health outcomes. If anything, public health and safety are harmed, not promoted, by the direction of this new Gun Rights 2.0 movement.

6. The effects of state laws regulating firearms on subsequent changes in firearm mortality

Terry L. Schell PhD¹, Rosanna Smart PhD¹, Matthew Cefalu PhD¹, Beth Ann Griffin PhD¹, Andrew R. Morral PhD¹

¹*RAND*

Statement of Purpose: This research uses changes in state law over time to estimate the effects of ten state firearms policies on firearm death rates in the five years after their implementation. The research also estimates the joint effects of conceptually related groupings of those policies to draw broader conclusions about the effects of the regulatory environment. **Methods/Approach:** The study used mortality data from the CDC, law data from the RAND State Firearm Law Database, and covariates selected to control for potential confounds (household gun ownership rate, political control of the state, violent crime rates, and economic conditions). Effects were estimated within a debiased, second-order autoregressive model, implemented as a Bayesian negative binomial model of deaths with a population offset. Prior research demonstrated this modeling approach provides the most accurate estimation of causal effects in these data (Cefalu, et al, 2021). **Results/Conclusion:** Effects for specific policies were generally small in magnitude and had considerable uncertainty. The two policies with the highest probability of being beneficial were Child Access Prevention and Minimum Age laws. Those with the highest probability of being harmful were Right to Carry and Stand-your-Ground laws. However, looking at the joint effects of laws reveals larger and more precisely estimated effect sizes. The probability of decreasing death rates when moving from the most permissive to most restrictive set of firearm regulations exceeded 0.99, and this change was estimated to reduce firearm deaths by 18%. **Innovation & Significance to Field:** While estimating effects for specific narrowly defined firearm regulations offers theoretical clarity, the empirical effect estimates for these small slices of the broader regulatory framework generally yield small and uncertain effects sizes. However, the joint effects of combinations of laws can be estimated well and demonstrates that restrictions on firearms are associated with substantial benefits on firearm mortality.

7. The Cost of Firearm Injuries and Fatalities in the United States, 2019

Lois K. Lee MD MPH^{1,2}, Eric Fleegler MD MPH^{1,2}

¹*Division of Emergency Medicine, Boston Children's Hospital,* ²*Department of Pediatrics and Emergency Medicine, Harvard Medical School*

Statement of Purpose: Firearm injuries and deaths result in substantial healthcare and societal costs. Non-fatal firearm shootings can result in injuries requiring significant medical as well as life-long quality of life, work loss, and medical rehabilitation care costs. The objective of this study was to analyze the medical and societal costs of firearm injuries and fatalities in the U.S. **Methods/Approach:** This was a cross-sectional study of costs of firearm-related injuries and fatalities using the Centers for Disease Control and Prevention's Web-based Injury Statistics Query and

Reporting System (WISQARS) Cost of Injury data for 2019. For nonfatal emergency department (ED) visits and hospitalizations, we calculated aggregate total costs and costs in the following categories: medical, work loss, and quality of life loss over the subsequent year. For fatalities, we calculated medical costs and aggregate costs for the value of statistical life. **Results/Conclusion:** There were approximately 129,938 injuries and 39,707 fatalities from firearms in the U.S. in 2019. Total costs associated with firearm injuries and fatalities was \$486 billion. For discharged nonfatal ED visits the total cost was \$2 billion: medical \$933 million, work loss \$90 million, and quality of life loss \$952 million. For nonfatal hospitalizations the total cost was \$14.9 billion: medical \$7.5 billion, work loss \$639 million, and quality of life loss \$6.7 billion. Assaults accounted for the highest total costs for nonfatal ED visits (84%) and hospitalizations (81%). For fatalities the combined costs were \$393 billion: medical \$234 million and total value of statistical life costs \$393 billion. Young adults (20-29 years) account for a disproportionate amount with total fatality costs of \$103 billion.

Innovation & Significance to Field: Understanding the healthcare and societal costs are critical for contextualizing the public health impacts of and to emphasize the significance of firearms as a public health problem.

Session 13: Understanding and addressing disparities-Epidemiology and intervention (Part II)

Congressional Rooms, December 1, 1:15 - 2:45 PM

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1. Long-term trends of firearm suicide among American Indian and Alaska Native young adult men, 1999-2020

Amelia C. Mueller-Williams MSW MPH¹, Mark S. Kaplan DrPH¹

¹Department of Social Welfare, Luskin School of Public Affairs, University of California, Los Angeles

Statement of Purpose: Suicide rates are exceptionally high among young non-Hispanic American Indian and Alaska Native (AIAN) men, with rates almost twice as high as any other group when stratified by age, sex, and race. Young adult men also experience high rates of firearm violence overall. A recent CDC MMWR report noted a 48.1% increase in firearm suicides among AIAN men between 2019 and 2020. This study examined the long-term temporal trends in firearm suicides among AIAN young adult men. **Methods/Approach:** Using mortality data from the CDC's Web-based Injury Statistics Query and Reporting System from 1999 through 2020, we conducted joinpoint analyses on firearm suicide deaths among males aged 18 to 29 years. Statistically significant changes in trends were identified (2-sided $p < .05$), annual percentage change (APC) estimates and 95% CIs are reported. **Results/Conclusion:** Over the study period, firearm suicide rates among young adult AIAN men increased by 35.7%, with a significant linear increase from 1999 to 2020 (APC, 1.47%, CI: 0.2%, 2.7%). APC results indicate firearm suicide rates fluctuated between 1999 and 2007 but significantly increased from 2007 to 2018 (APC, 2.3%; CI: 0.1%, 4.5%). Though the firearm suicide rate per 100,000 increased from 25.54 in 2018 to 34.72 in 2020, the trend was not statistically significant (APC, 16.04%; CI: -9.7%, 49.2%). **Innovation & Significance to Field:** AIAN young men experience an extremely high vulnerability to suicide. Trends suggest a significant increase in the burden of firearm suicides among AIAN young men in recent years. Additional years of data will help clarify sharp increases in observed rates. Thus, there is an increased need for firearm-specific suicide prevention efforts for AIANs, ranging from micro (e.g., safe storage) to macro (e.g., firearm legislation) levels. The hidden epidemic of firearm suicide in this community deserves far more attention from researchers and policymakers.

2. Rural Alaska Native Perspectives about Firearms, Home Storage Practices and Youth Access

Lisa Wexler PhD MSW^{1,2,3}

¹UM School of Social Work, ²Institute for Social Research, ³Institute for Firearm Injury Prevention

Statement of Purpose: The majority of households in rural Alaska have multiple firearms, with at least one stored 'unsafely' (unlocked or loaded). This environmental risk is one reason that rural Alaskan communities suffer disproportionately from youth suicide. The exploratory mixed methods research with Alaska Native collaborators characterizes household firearm storage practices, associations, and describes young people's access to firearms depending on age. This formative work will guide development of a universal, clinic-based intervention to foster safe firearm storage at home. **Methods/Approach:** Focus groups and interviews with 45 community members explored their normative associations with firearms, motivations for safely storing household guns, and other factors influencing firearm access and storage practices in their homes. To understand the prevalence of different home practices, local and cultural associations, and to consider differences across age, gender and gun ownership status (both gun owners and other adults in the household), the study culturally-adapted the National Firearms for Children and Teens Survey (FACTS) survey, analyzed data from 200 adults. **Results/Conclusion:** Qualitative analysis highlights the value of firearms for subsistence hunting, cultural continuity, and the safety of children as primary motivations for storing firearms unloaded and locked. Adults in households tend to share responsibility for gun safety to keep young people safe. Descriptive survey analysis show that the majority of households store most firearms safely, but that a sizable portion still have at least one accessible firearm. Although households with children are more likely to store their firearms safely, many adolescents could access home firearms. According to adults, 51.69% of teenagers (ages 12-17) they live with were able to use firearms with adult supervision and 14.61% with adult permission

without supervision. **Innovation & Significance to Field:** Adult family members' commitment to youth safety can support efforts to reduce the environmental risk posed by accessible home firearms.

3. Racism experience and firearm injury risk among Asian Americans

Hsing-Fang Hsieh MPH PhD¹, Tsu-Yin Wu PhD RN FAAN², Marc A. Zimmerman PhD^{1,3}

¹*School of Public Health, University of Michigan*, ²*Center for Health Disparities Innovation and Studies, Eastern Michigan University, Ypsilanti, MI, USA*, ³*Institute for Firearm Injury Prevention, University of Michigan*

Statement of Purpose: Despite increased racism acts against and increased firearm ownership among Asian Americans (As-A) since the COVID-19 pandemic, limited research has examined the relationship of racism and firearm-related injury risk in this population. The purpose of this study is to: 1) describe profiles of firearm behavior, alcohol use, and mental distress associated with firearm injury risk, and 2) examine if racism experience is predictive of different risk profiles. **Methods/Approach:** We use cross-sectional data collected from an online-survey of 916 As-A's residing in the U.S. Firearm risk behavior was a composite measure of firearm ownership, firearm purchase since the COVID-19 Pandemic, firearm carriage since the COVID-19 Pandemic, and firearm storage behavior (range 0-4). We conducted a latent profile analysis using the firearm behavior variable, alcohol use, and mental distress to describe distinct pattern of firearm risk. We then use a 2-stage multivariate approach to test if racism experience predicted different patterns while controlling for sex, age, education, income and ethnicity. **Results/Conclusion:** Three latent profiles were identified: high-risk (n=49, 5.35%); moderate-risk (n=118, 12.88%); and low risk (n=749, 81.77%). Relative to the low risk group, higher racism/discrimination was associated with being in the high-risk profile (b=0.557, p<0.001) and moderate risk profile (b=0.249, p=0.032). Being male (b=2.434, p=0.005) and younger age (b= -0.968, p=0.006) are also more likely to be in the high risk group. **Innovation & Significance to Field:** This is the first study to investigate the patterns of firearm injury related risk factors among AsA's. Our results suggest that racism experienced by Asian Americans since the COVID-19 pandemic is linked to an increased risk of firearm injury through more engagement in riskier firearm behavior, alcohol use, and mental distress. The results suggest that addressing racism may be a useful prevention strategy for reducing firearm injury risk among As-A's.

4. Gun Violence Among Female Offenders and the Risks of Future Prison Violence

Courtlyn Fields MA^{1,2}, Salpi Kevorkian MS^{1,2}, Nicholas Thomson PhD^{2,3}

¹*Department of Surgery, Virginia Commonwealth University*, ²*Injury and Violence Prevention Research Lab*, ³*Department of Surgery and Psychology, Virginia Commonwealth University*

Statement of Purpose: Research on female perpetrated violence is limited, and research on gun violence among women is even more scarce. Limited attention to violent female offenders may be related to lower rates of incarceration of female offenders than male offenders, and an overall lack of understanding of gender-specific criminological pathways. As such, there is a dearth of findings detailing the risks of gun violence in female offenders, which may impact treatment efficacy and safety during incarceration. The aim of this study is to assess whether women who were convicted of a firearm-related violent crime were more likely to committed in prison violence when compared to women who were convicted of a violent crime without a firearm, or a non-violent crime. **Methods/Approach:** In a sample of 206 incarcerated female offenders (Mage =37, age range: 20-61 years), we conducted multinomial logistic regressions to test the likelihood of women belonging to a violent crime group (firearm-related violence, violent, and non-violent crime group) based on their perpetration of violence during incarceration over a 12-month period. **Results/Conclusion:** Female offenders who engaged in violent prison misconducts were eight times more likely to have committed a firearm-related crime when compared to the nonviolent crime group (OR=8.31, p <.001). Similarly, this group was nearly four times more likely to have committed a firearm-related crime when compared to the violent (non-firearm) crime group (OR=3.95, p=.023). **Innovation & Significance to Field:** This is the first study of its kind that demonstrates female offenders who commit a firearm-related crime present significantly greater risk for prison violence than women who do not commit a firearm-related crime. Understanding firearm-related violence among women can inform gender-specific violence reduction approaches as well as understanding risk for future offending. These findings also demonstrate that existing interventions should be tailored to address firearm-related violence, particularly among violent women.

5. A spatial analysis of intersectional forms of structural racism and firearm violence in Baltimore City

Mudia Uzzi MSc^{1,2}, Lea Marineau MSN CRNP³, John Jackson ScD⁴, Lorraine Dean ScD⁴, Carl Latkin PhD², Danielle German PhD², Daniel Webster ScD¹, Cassandra Crifasi PhD¹

¹Center for Gun Violence Solutions, Johns Hopkins Bloomberg School of Public Health, ²Department of Health, Behavior, and Society, Johns Hopkins Bloomberg School of Public Health, ³Johns Hopkins School of Nursing, ⁴Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health

Statement of Purpose: There is growing interest in assessing the association between structural racism and firearm violence inequities. However, limited research has used statistical modeling to examine the multidimensional nature of structural racism in relation to firearm violence. We conducted spatial regression models to investigate the association between intersectional forms of structural racism and firearm violence in Baltimore City. **Methods/Approach:** We performed an ecological cross-sectional study of 198 census tracts in Baltimore from 2015-2019. For each tract, we determined scores for two forms of structural racism 1) historic redlining 2) contemporary racialized economic segregation. The redlining and segregation scores were dichotomized into two categories signifying the tracts' level of disadvantage or advantage. Our redlining and segregation binary variables generated four intersectional groups of structural racism. We geocoded and aggregated individual incidents of shootings (fatal and nonfatal) to the tract level. We conducted a quasi-Poisson regression to determine associations between our structural racism intersectional groups and tract-level firearm violence incidents. To reduce residual spatial autocorrelation, we ran a spatial regression using eigenvector spatial filtering. **Results/Conclusion:** In unadjusted models, sustained disadvantage census tracts (tracts that experience contemporary socioeconomic disadvantage and were historically redlined) had almost five times higher rates of firearm violence (IRR= 4.96; 95% CI: 3.15, 8.18; p <0.001) compared to sustained advantage census tracts (tracts that experience contemporary socioeconomic advantage and were not historically redlined). **Innovation & Significance to Field:** Using spatial modeling to investigate intersectional forms of structural racism can determine firearm violence inequities above and beyond modeling only individual forms of structural racism. To improve causal analyses of structural racism and firearm violence, novel modeling techniques are needed as many common model covariates (e.g. vacant housing, education) have deep connections to structural racism as well.

6. The Toll it Takes: Concentrated Disadvantage, Local Gun Violence, and Neighborhood Health in 100 U.S. Cities

Daniel C. Semenza PhD^{1,2}, Richard Stansfield PhD³, Ian Silver PhD⁴, Brielle Savage MA³

¹New Jersey Gun Violence Research Center, ²Department of Sociology, Anthropology, and Criminal Justice, Rutgers University, ³Department of Sociology, Anthropology, and Criminal Justice, Rutgers University - Camden, ⁴Department of Law and Justice Studies, Rowan University

Statement of Purpose: Extant research demonstrates community gun violence is harmful to a variety of mental and physical health outcomes. However, this work is generally conducted among individuals with far less attention to community-level health outcomes. Further, prior research has typically been restricted to examining one or a handful of cities with limited theorizing for how gun violence operates as a social determinant of health. This study examines how changes in rates of fatal and non-fatal gun violence in neighborhoods correspond to community health outcomes in 100 of the largest U.S. cities. **Methods/Approach:** We combine data from numerous sources including AmericanViolence.org, the American Communities Survey, and CDC PLACES data to analyze the relationship between changes in fatal and non-fatal gun violence and community health in almost 16,000 neighborhoods. Following a factor analysis of ten related health measures, we conduct a series of lagged conditional latent growth and correlated traits models to analyze the longitudinal effects of changes in gun violence on changes in neighborhood health. We test whether gun violence meaningfully mediates the relationship between concentrated disadvantage and health in local communities. **Results/Conclusion:** Increases in fatal and non-fatal gun violence over time correspond to poorer overall community health, as well as specific adverse outcomes related to health behaviors, mental and physical health status, and preventive health. Further, rates of gun violence in neighborhoods substantially mediates the relationship between concentrated disadvantage and community health. **Innovation & Significance to Field:** To our knowledge, the data used in this study represent the most comprehensive database of

neighborhood-level factors related to gun violence in local communities currently available. The results underscore that gun violence is a critical social determinant of community health, operating as a key mechanism between broad concentrated disadvantage and multiple facets of collective well-being.

7. Abandoned Housing Interventions and Gun Violence in Low-income Black Neighborhoods: A Citywide Cluster Randomized Trial

Eugenia C. South MD MS¹, John MacDonald PhD², Vicky Tam MA^{3,4}, Greg Ridgeway PhD^{2,5}, Charles Branas PhD⁶

¹Urban Health Lab, Department of Emergency Medicine, School of Medicine, University of Pennsylvania, ²Department of Criminology and Sociology, School of Arts and Sciences, University of Pennsylvania, ³Data Science and Biostatistics Unit, Department of Biomedical and Health Informatics, ⁴Children's Hospital of Philadelphia, ⁵Department of Statistics and Data Science, Wharton School, University of Pennsylvania, ⁶Department of Epidemiology, Center for Injury Science and Prevention, Mailman School of Public Health, Columbia University

Statement of Purpose: Structural racism has resulted in longstanding disinvestment and dilapidated environmental conditions in Black neighborhoods. Abandoned houses signal neglect and foster stress and fear for residents, ultimately weakening social ties and contributing to gun violence. Our objective was to determine if abandoned house remediation reduces gun violence. **Methods/Approach:** We conducted a cluster randomized trial conducted from January 2017 to August 2020 where abandoned houses across all of Philadelphia, PA were randomly selected for inclusion in the study. The study consisted of three arms: (1) full remediation (installing working windows and doors, cleaning trash, weeding); (2) trash cleanup and weeding only; and (3) a no intervention control. A difference-in-differences mixed-effects regression was used to estimate the impact of the interventions on three gun violence outcomes (weapons violations, gun assaults, and shootings). **Results/Conclusion:** From a master list of 3630 abandoned houses, 3265 (89.9%) were deemed eligible for the study. 63 clusters containing 258 abandoned houses were randomly selected and randomly allocated to a study arm. Study neighborhoods were predominantly Black and had high percentages of low-income households. Counts of all gun violence outcomes went up in all arms of the study, but went up the least in the full remediation arm. The full housing remediation arm, compared to the control condition, resulted in reduced weapons violations by -8.6% [95% CI, -11.1 to -5.8], reduced gun assaults by -13.8% [95% CI, -18.9 to -7.9], and reduced shootings by -7.4% [95% CI, -12.3 to -1.9]. Gun assaults only went down in the trash clean-up arm compared to control. **Innovation & Significance to Field:** In low-income, predominantly Black neighborhoods, inexpensive, straightforward abandoned housing interventions can reduce gun violence. Interventions to the neighborhood environment, including vacant lot greening, tree planting, and structural repairs to occupied homes should be included in any comprehensive violence prevention effort.

Session 14: Evaluating education and media campaigns in the field of firearm injury prevention

Capitol Room, December 1, 1:15 - 2:45 PM

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1. Mass shootings and mass media: Test of the contagion hypothesis

James Alan Fox PhD¹, Nathan E. Sanders PhD², Emma E. Fridel PhD³, Grant Duwe PhD⁴, Michael Rocque PhD⁵

¹*School of Criminology and Criminal Justice, Northeastern University*, ²*Berkman Klein Center, Harvard University*,
³*College of Criminology and Criminal Justice, Florida State University*, ⁴*Minnesota Department of Corrections*,
⁵*Sociology Department, Bates College*

Statement of Purpose: Mass public shootings have generated significant levels of fear in recent years, with many observers criticizing the media for fostering a moral panic, if not an actual rise in the frequency of such attacks. Research suggests that the media can potentially impact the prevalence of mass shootings in two respects: 1) some individuals may be inspired to mimic the actions of highly publicized offenders; and 2) a more general contagion process may manifest as a temporary increase in the likelihood of shootings associated with a triggering event. The contagion hypothesis received a boost from research by Towers et al. (2015) which, however, did not include any measure of publicity, thus resting on the implicit but flawed assumption that all mass shootings are equally newsworthy. **Methods/Approach:** We measured the amount of media coverage about mass shootings in 16 major newspapers, the AP National wire, and network television newscasts along with the number killed in mass shootings for each day from 1/1/2000 through 12/31/2018. After examining the sequencing of news coverage prior and subsequent to mass shootings, we applied multivariate point process models to disentangle the correlated incidence of mass public shootings and news coverage of such events. **Results/Conclusion:** The findings suggest that mass public shootings have a strong effect on the level of news reporting, but that news reporting has little impact, at least in the short-term, on the subsequent prevalence of mass shootings. Also, the results appear to rule out the presence of strong self-excitation of mass shootings. **Innovation & Significance to Field:** The results are significant with respect to debates over how the media should report on deadly shootings. We conclude with recommendations about the news media's approach to covering mass shootings so as to avoid imitation and contagion.

2. Becoming a Gun Violence Survivor: Unpacking the Relationship between Experiences of Gun Violence and Engagement in Gun Politics

Jennifer Carlson PhD¹

¹*School of Sociology and School of Government & Public Policy, University of Arizona*

Recently, the gun violence prevention movement has been invigorated by the growing organization of gun violence survivors as political actors. Yet, those who identify, and organize accordingly, as gun violence survivors is a small fraction of the 40,000-plus people who are killed with guns, the roughly 100,000 people who survive gunshot wounds, and the friends, families and community members that are impacted every year. Under what conditions do people identify as gun violence survivors, and for whom does this identification develop into political voice? This presentation, which is based on a broader project by the National Science Foundation, examines these questions by examining the experiences of people who have witnessed shootings, have been shot and survived, and/or have had a loved one killed. Specifically, it focuses on in-depth interviews with self-identified gun violence survivors in California and Florida, two states with similar levels of gun violence but different gun laws and political contexts. Rather than approach "gun violence survivor" as a monolithic identity, the presentation identifies four key axes that capture how people understand themselves as gun violence survivors: the social construction of gun violence as a 'life event' versus a 'life hazard'; community- versus individual-oriented accounts of responsibility with respect to gun violence; expansive versus exceptional beliefs surrounding trauma, grief and bereavement; and experiences of multifaceted versus restricted social support. For each of these axes, race, class and gender interact to stratify the experiences of people impacted by gun violence, shaping not only *how* they survive gun violence but also how they *identify* as gun

violence survivors and *with what political consequences*. This project contributes to understanding the relationship between gun violence and gun politics by providing insight into how gun violence is experienced differently across different groups of people and how these experiences shape the politics of survivors.

3. Publication Trends in Gun Violence Research, 2021

Kelly Drane MHS¹, Alex Nguyen MPH MA²

¹Research Director, Giffords Law Center to Prevent Gun Violence, ²Research Manager at Giffords Law Center to Prevent Gun Violence

Statement of Purpose: In recent years, there has been a resurgence of public and private funding for gun violence research. To understand current trends in gun violence research and help steer new funds more equitably and effectively, we comprehensively tracked, reviewed, and qualitatively coded every peer-reviewed study published in 2021 related to gun violence and gun policy.

Methods/Approach: Eligible publications were identified through PubMed and Google Scholar alert systems. Included articles both (1) were published or made available in a peer-reviewed journal in 2021 and (2) provided novel scientific analysis related to the causes, consequences, characterization, or prevention of firearm violence and injury in the United States. 493 articles met the inclusion criteria. Each article was then coded to identify factors related to the type of gun violence covered in the article, the main area of focus of the article, and other relevant characteristics. **Results/Conclusion:** Twenty-seven percent of articles provided specific focus on gun suicide—roughly half as many articles as those that provided specific focus on gun homicide. Seventy percent of identified studies were focused on describing the problem of gun violence and the factors that impacted the likelihood of gun violence occurring. A smaller number of articles studied policy or programmatic solutions to gun violence, with only three percent of studies evaluating the impact of policy on gun injury or death. Very few studies (1.4%) involved participation from impacted communities in the research design. **Innovation & Significance to Field:** Conducting more and better research is an essential step to help keep communities safe from gun violence. As the field of gun violence research changes and new money is allocated for this vital work, there is substantial opportunity for researchers, funders, and policymakers to address gaps in current scientific attention and produce more equitable, responsive research on this crisis.

4. How Americans encounter guns: Mixed methods content analysis of YouTube and internet search data

Megan L. Ranney MD MPH^{1,2}, Frederica R. Conrey PhD³, Leah Perkinson MPH BA¹, Stefanie Friedhoff¹, Rory Smith MSc¹, Claire Wardle PhD¹

¹Brown University School of Public Health, ²Alpert Medical School of Brown University, ³Harmony Labs, New York City, NY,

Statement of Purpose: YouTube is used by approximately half of Americans each day. Despite growing interest in using these channels to prevent firearm-related harms, empirical work on online firearm-related narratives is lacking.

Methods/Approach: This research used a commercial dataset containing YouTube browsing behavior of a representative sample of American adults over a 9-month period in 2021. Using fast-greedy clustering to partition users and channel interactions, we identified all naturally occurring firearm-related content ecosystems that reached more than 1/1000 YouTube users per day. We used descriptive statistics and qualitative analysis to examine characteristics, demographics and internet search patterns affiliated with each ecosystem. **Results/Conclusion:** The 72,205 panelists had 16,803,075 person-video encounters with 7,274,093 videos; 282,419 videos were related to firearms. On average, 7% of viewers consumed a video related to firearms on a given day. Seven channel-based content ecosystems were identified. They were diverse in reach (from 1-15 per 1,000 YouTube viewers per day), users (wide range of age, race, ethnicity, and gender), and content (e.g., guns for self-protection vs. guns for fun). On average, 0.5% of panelists performed a firearm-related internet search on a given day. The vast majority of these searches were related to mass shootings or police-involved shootings (e.g., “active shooter”), and virtually none were about more common firearm harm such as suicide. Searches for firearm safety information were most common among panelists affiliated with the “Hunting & Fishing” and “Guns & Gear” ecosystems, which were watched primarily by older, white men. **Innovation & Significance to Field:** These findings identify the major demographics

and content areas of YouTube firearm narratives. Future work should further define firearm-related narratives across online media spaces, and tailor and test firearm safety messaging for users affiliated with specific social media content ecosystems.

5. How the firearm industry and associated groups frame the evidence on gun-related harm and violence to the public and policymakers

Nason Maani PhD^{1,2}, Zain Hussain MD², May CI Van Schalkwyk MD³, Sandro Galea MD DrPH², Mark Petticrew PhD¹

¹Department of Public Health, Environments and Society, Faculty of Public Health and Policy, London School of Hygiene and Tropical Medicine, ²Department of Epidemiology, School of Public Health, Boston University, ³Department of Health Services Research and Policy, Faculty of Public Health and Policy, London School of Hygiene and Tropical Medicine

Statement of Purpose: Firearm-related violence continues to impose a heavy burden of death and disability in the United States. It has been recently argued that the firearm industry should be considered a commercial determinant of health, like the tobacco industry. This study sought to analyse how the firearm industry and related organisations frame gun-related harm and violence to the public, and what policy responses are framed as legitimate.

Methods/Approach: The research analysed the discursive strategies adopted by seven of the largest firearm manufacturers and organisations funded by the firearm industry in the US. Two authors independently extracted textual material from web articles, press releases, annual reports and shareholder communications collected between 1st April 2019 to 1st April 2020 (396 documents). Thematic coding was guided by the literature on the commercial determinants of health and consensus reached through open discussion with a third author. Both deductive and inductive coding was adopted. The coded data was analysed using NVivo (version 12).

Results/Conclusion: The firearm industry and associated organisations frame the evidence and potential solutions in a way that limit impact on business. 5 main frames were identified: firearms as protective of health; firearms as an issue of personal responsibility; regulation as harmful and counterproductive, guns embodying the “American” way of life; and disputation of evidence on harms and regulation. These broadly resemble strategies employed by other harmful product industries. Future studies could analyse trends over time, include a range of contexts and documentation, including social media communications. **Innovation & Significance to Field:** This study is the first to identify the framing strategies employed by the firearm industry and associated organisations to reinforce its rhetoric and interests, using methodologies and frameworks developed to study other harmful product manufacturers, and is of interest to academic researchers, advocates and the wider public.

6. Preventing Firearm Violence as a Public Good: A Contingent Valuation Study in California

Nicole Kravitz-Wirtz PhD, MPH^{1,2}, Amanda J. Aubel MPH^{1,2}, Julia Lund MPH^{1,2}

¹Violence Prevention Research Program, Department of Emergency Medicine, University of California Davis School of Medicine, ²California Firearm Violence Research Center at UC Davis

Statement of Purpose: Firearm violence is a major public health and policy concern, yet there is a dearth of up-to-date information about the value the public assigns to the benefits of reducing firearm violence.

Methods/Approach: We used a double-bounded dichotomous choice contingent valuation approach in which we surveyed California adults from the Ipsos KnowledgePanel (N=2870) about their willingness to pay (WTP) [\$50/\$100/\$200] per year, in the form of a tax or donation, for a program that prevents 1 in every 10 [firearm homicides/firearm suicides/mass shootings]. Those that responded “yes” were asked about their WTP twice the initial amount. Those that responded “no” were asked about their WTP half the initial amount. Initial dollar amounts, sequencing of firearm violence types, and whether payment was a tax or donation were randomized. WTP estimates were calculated using the user-generated *doubleb* Stata command and weighted to represent the adult population of the state. **Results/Conclusion:** In general, most respondents were willing to pay to prevent firearm violence; depending on the type of violence and form of payment, 48% to 58% of respondents answered “yes” to either the initial question and/or the follow-up question. Specifically, we estimated an average WTP per respondent of \$75, \$54, and \$200 per year in extra taxes to prevent firearm homicide, firearm suicide, and mass shootings, respectively. WTP in the form of a donation was less: \$48, \$39, and \$177, respectively. Estimates were similar even after adjusting for household income and size. Firearm owners were willing to pay less than non-owners to prevent

firearm homicide (\$36 vs \$98 in taxes and \$13 vs \$66 in donations), firearm suicide (\$3 vs \$74 in taxes and -\$11 vs \$61 in donations), and mass shootings (\$179 vs \$210 in taxes and \$154 vs \$189 in donations). However, Black and Latinx firearm owners were willing to pay more than white firearm owners to prevent all 3 types of firearm violence and particularly homicide and suicide; e.g., Black and Latinx firearm owners were willing to pay \$29 and \$50, respectively, in extra taxes per year to prevent firearm homicide compared with \$8 for white firearm owners. **Innovation & Significance to Field:** Social assessment of the value of preventing firearm violence can help drive policy development and change. This study provides up-to-date estimates of the perceived costs of collective trauma and loss associated with firearm violence for a general population sample of adults and suggests that large shares of the population, including firearm owners, are willing to invest extra tax dollars in preventive strategies, even amid pandemic-related financial hardships.

7. Prepped and Ready: Evaluating the impact on home firearm storage of a remotely-delivered and live parent education program

Shayla A. Sullivant MD^{1,2}, Hung-Wen Yeh PhD^{1,2}, Alexandra Hartwig MS², Mark Connelly PhD^{1,2}

¹Division of Developmental and Behavioral Health, University of Missouri, Kansas City, ²Children's Mercy Kansas City

Statement of Purpose: Making firearms inaccessible at home reduces risk of youth suicide but often is not done. The current study evaluated the impact on home firearm storage of a parent education program ("Prepped and Ready") comprised of content promoting teen safety and tangible resources for securing home firearms.

Methods/Approach: Nineteen presentation sessions (10 live, 9 webinar) were completed. Presentation content emphasized the rationale and recommended approach to safe storage of firearms, along with information on other contemporary issues impacting teen health (e.g. vaping). Participants received a free gun lock if desired. Prior to viewing the presentation (T1), participants reported current firearm storage practices via online questionnaire. Immediately following the webinar (T2) and two weeks later (T3), participants completed additional questionnaires on safe storage knowledge and practices. Generalized linear mixed models with and without missing data imputation were used to evaluate changes over time in self-reported safe storage practices. **Results/Conclusion:** Nine-hundred nine caregivers from unique households viewed the presentation (581 live, 328 webinar) and completed T1 surveys; 70.6% and 78.4% of each sample respectively completed T3 surveys. Among live participants owning firearms, the odds of storing firearms locked up, unloaded, with ammunition locked separately increased 5.9 times (95% CI 2.6-13.5, $p < 0.001$) without imputation or 2.0 times (95% CI 1.1-3.4, $p = 0.02$) with the worst-case imputation. The odds of webinar participants using a cable gun lock between T1 and T3 more than doubled (2.88 times without imputation, 95% CI 1.36 – 6.14, $p = 0.006$; or 2.09 times with worst-case imputation, 95% CI 1.02 – 4.29, $p = 0.02$).

Innovation & Significance to Field: Making firearms inaccessible to youth in the home could save lives. Provision of education about teen brain development and impulsivity paired with tools provided in the community may be one way to motivate parents to implement changes.