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Evaluating the Effect of Project Longevity on Group-Involved Shootings and Homicides in New Haven, CT

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ABSTRACT

Beginning in November of 2012, New Haven, CT served as the pilot site for a statewide, focused deterrence gun violence reduction strategy named Project Longevity. Drawing on the group violence intervention (GVI) model pioneered in the 1990s as Boston Ceasefire, Longevity looked to reduce gun violence by focusing law enforcement, social services, and community members on members of violent street groups that are disproportionately involved in gun violence as victims and offenders. Using autoregressive integrated moving average models, we test for a programmatic effect of the Longevity intervention on group member involved (GMI) shootings and homicides. Controlling for the possibility of a non-New Haven specific decline in gun violence, a decrease in group offending patterns, and the limitations of police-defined GMI categorization of shootings and homicides, the results of our analysis show that Longevity is associated with a reduction of almost five GMI incidents per month. These findings bolster the growing body of research confirming the efficacy of focused deterrence approaches to reducing gun violence, and suggest the need for further research on similar initiatives across the varying contexts in which they are implemented.

INTRODUCTION

In 1991, New Haven, Connecticut recorded a thirty year high of 36 homicides, mirroring the rates of violent crime that affected many American cities during the rise of the "crack epidemic" (Blumstein and Rosenfeld 1998; Cook and Laub 1998; Tonry and Moore 1998). Following one of the largest and longest running crime declines in American history (Zimring 2007), the homicide count in New Haven plummeted by 78 percent from 1991 to 2003. Shortly after 2003, however, homicides in New Haven began to buck the national crime decline and began trending upward. In 2011, New Haven came just shy of its 1991 high with 34 homicides (see Figure 1). With a murder rate of 26.2 per 100,000 in 2011, New Haven's murder rate outpaced Washington D.C. and Chicago, and was on par with Oakland, California.[1]

Figure 1. New Haven Homicides, 1985-2011

As a response to the mounting death toll, in 2011 state and local officials partnered with the New Haven Police Department, social service providers, and New Haven community members to implement a data-driven gun violence reduction strategy. With the formation of this partnership, New Haven became the pilot site for a state-wide gun violence reduction project that had shown success in cities like Boston and Chicago. (Braga, Kennedy, Waring, et al. 2001; Papachristos, Meares, and Fagan 2007). Drawing on the successful efforts of these and other cities in reducing gun violence, in 2012 New Haven's Project Longevity began, its strategy focused on targeting the small population of high-risk, high-rate offenders, often gang- or street group-involved, who account for the majority of gun violence (Kennedy 1997; Kennedy, Braga, and Piehl 1997). Project Longevity would be the first time that such a strategy was to be

[1] Homicide rates were drawn from the FBI's Uniform Crime Reports for 2011.

implemented at the statewide level, with the strategy slated to be implemented in Bridgeport and Hartford in the ensuing year (Office of Public Affairs 2012).

This article examines the efficacy of Project Longevity in reducing gun violence in New Haven after its first three years of continuous operation. Specifically, we analyze whether or not the timing of Longevity affected the levels of group member involved (GMI) shootings and homicides. Our results suggest that the initiation of Project Longevity is associated with a significant decrease in GMI shootings and homicides during the observation period. Using Hartford, CT as a comparative case, we find that the observed decrease of GMI gun violence in New Haven is not part of a Connecticut-wide decline in violent crime, nor a New Haven-specific decline in crime. In short, our findings provide some evidence that the observed decline in GMI shootings and homicides in New Haven is strongly associated with the timing and implementation of Longevity.

BACKGROUND

Two parallel developments in American policing set the stage for the focused deterrence strategies which Project Longevity is modeled upon: *problem-oriented policing* and *community policing* (Kelling and Moore 1988).

American policing in the 1970s was characterized by an unquestioned emphasis on the "means over ends," creating the assumption that the best way to improve police was to improve departmental management and operations (Goldstein 1979). Moving away from the emphasis on professionalization and bureaucratization that characterized the "reform era" of policing (Kelling and Moore 1988), problem-oriented policing posits that police are better served by addressing problems through a process of "identification, analysis, response, evaluation, and adjustment of the response" (Braga, Kennedy, Waring, et al. 2001:196). Instead of mobilizing resources to address individual events, or to, say, maximize the efficiency with which officers respond to *all* calls for service, problem-oriented policing is geared towards identifying a particular problem, the best way to address that problem, and to evaluate and subsequently tweak said response to maximize its effect on the problem at hand.

In conjunction with the advent of problem-oriented policing, community policing gained popularity in the 1980s and 90s as a way for police to mend the relationships so strained by the social upheaval of the 1960s and 70s. Although there is debate as to the particulars of what constitutes community policing (see the discussion by Rosenbaum and Lurigio 1994), two of community policing's core principles are "proactive problem-solving strategies" (Rosenbaum 1988) and the inclusion of community residents in the problem-solving process (Skogan 1990).

Drawing from both of these developments, the group violence intervention (GVI) pioneered in Boston in the 1990s is a *focused deterrence* strategy aimed at reducing shootings and homicides driven by criminally active street groups (Braga, Kennedy, Piehl, et al. 2001; Braga, Kennedy, Waring, et al. 2001).[2] As the name focused deterrence implies, deterrence is

[2] Group Violence Intervention (GVI) (at one time called the "group violence reduction strategy" or GVRS) is the name of the strategy currently being implemented in dozens of U.S. cities with the support of the National Network

still integral to GVI – the strategy still employs the promise and use of certain, swift, and severe punishment to dissuade undesired behavior (Akers 1999; Gibbs 1975; Stafford and Warr 1997; Zimring and Hawkins 1973). The GVI approach departs markedly from traditional deterrence techniques such as increasing police presence in a general area or engaging in mass police sweeps or "crackdowns" (Weisburd et al. 2010). Instead, GVI focuses on the small number of individuals, often times involved in street gangs or groups, that account for the vast majority of gun violence in cities and makes use of a wide variety of legal "levers" on individuals who are often repeat offenders and, thus, under state supervision of some sort, e.g. probation or parole (Braga, Hureau, and Winship 2008; Kennedy, Piehl, and Braga 1996).[3] In other words, rather than cast its net broadly and increase penalties across large parts of the population, the GVI approach identifies very particular problems (e.g. street group involved gun violence) and mobilizes resources towards that problem and those individuals most likely to be involved as perpetrators and victims.

The strategy hinges on cooperation between law enforcement, community members, and social service providers to disseminate a unified message to members of violent street groups that a) the violence must stop, b) those who continue to engage in violence will meet with focused law enforcement attention, and c) there are social services available for those who want them. Before this unified message is given to members of street groups, however, the law enforcement partners of the program cooperate with researchers to conduct a problem analysis of shootings and homicides in a given city. If the program is to be truly focused, problem analysis is one of the keys in guiding programmatic efforts.

PROJECT LONGEVITY – NEW HAVEN, CT

The GVI strategy in Connecticut, branded as Project Longevity, began in New Haven in August of 2012. It began with a problem analysis composed of two parts: a *group audit* and an *incident review*. The group audit is a focus group style meeting in which various law enforcement practitioners are guided through a mapping and survey exercise to collect detailed information on street groups in a given municipality (Sierra-Arevalo and Papachristos 2015).[4] During the audit, information is collected on the active street groups in the city, harnessing the unique "experiential assets" of law enforcement officers to better understand the geographic location of street groups, who is in them, and what activities members are engaging in (Kennedy et al. 1997). Additionally, because much of the violence perpetrated by street groups is part of a reciprocal process of intergroup conflict (e.g. Papachristos 2009), a key part of the audit is the collection of relational data detailing the system of feuds and alliances between street groups (Kennedy et al. 1997; Sierra-Arevalo and Papachristos 2015a).

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for Safe Communities (NNSC) and John Jay College of Criminal Justice. For more information, see http://nnscommunities.org/our-work/strategy/group-violence-intervention

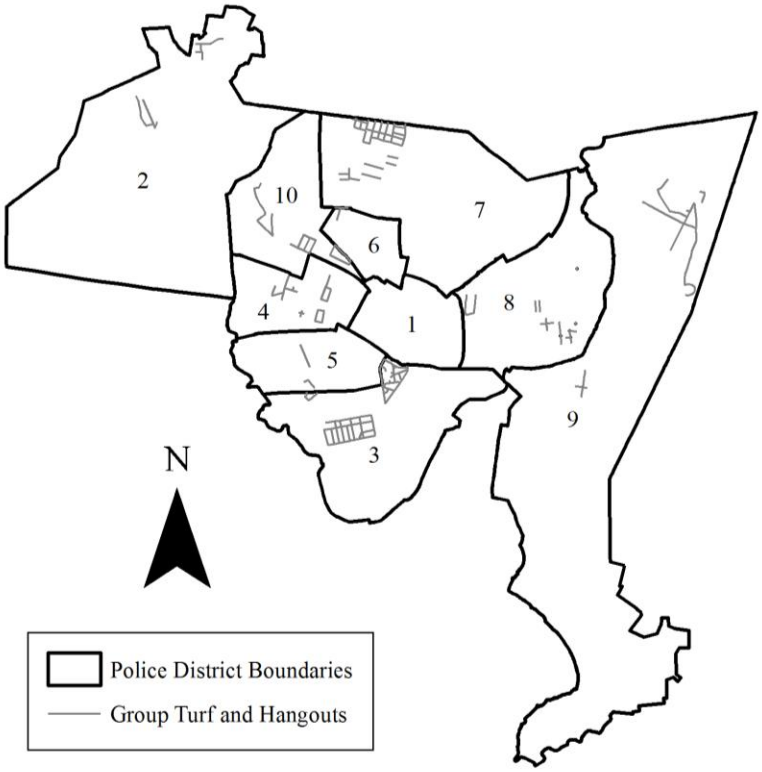
[3] See Kennedy (1997) for a thorough discussion of the "pulling levers" approach.

[4] In the case of New Haven, researchers from Yale University and University of New Haven worked with representatives from the New Haven Police Department, Connecticut Probation and Parole, and the U.S. Attorney's Office.

The incident review also leverages the experience of law enforcement officers, but is tailored to gather information on shootings and homicides. Specifically, the incident review aims to assess which groups are most actively involved in gun violence and the circumstances surrounding each shooting. Officers are presented with information about past shootings and homicides, including victim and offender information, location, and any other information about the circumstances of the event. Officers are then tasked with identifying whether the event was group member-involved (GMI), based on whether the victim or the perpetrator is a member of a group identified during the group audit process.[5]

The initial problem analysis in New Haven showed the existence of 52 unique groups at the time of the audit, with 440 identified street group members. Audit participants also located these groups in geographic space by drawing them on a map. Figure 2 shows a map of New Haven's ten police districts and the street blocks that law enforcement experts denoted as "turf" or "set space" of identified groups.

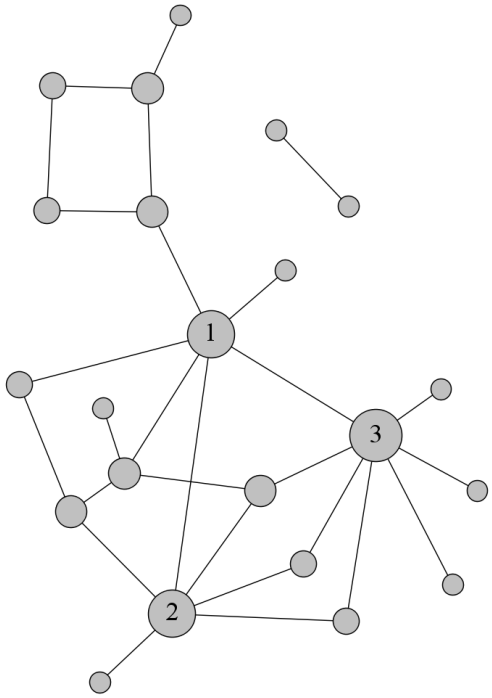
Figure 2. New Haven Group Turf



[5]The definition of "group" does not necessarily overlap with official legal or departmental definitions of a "gang." Instead, it can be "any set, clique, or crew of individuals" that commit crimes together (National Network for Safe Communities 2013:36). See Sierra-Arevalo and Papachristos (2015a) for a discussion of the importance of this broader definition of groups/gangs for avoiding "nation conflation" in audits.

Longevity's focused approach meant that only those groups involved in gun violence would become part of the program. Not all of the 52 identified groups were involved in shootings or violent crime. Similarly, not all identified groups were involved in active feuds with other street groups – only 42 percent (N=22) of groups were engaged in conflict at the time of the audit. Figure 3 shows the network graph of feuds among these groups. Each node represents a unique street group, the edges connecting nodes represent a feud between those groups. The nodes are weighted by how many feuds the group is involved in, with larger nodes being involved in more feuds.

Figure 3. New Haven Feud Network



As seen in Figure 3, three groups stood out as being involved in a disproportionate number of feuds in New Haven (nodes labeled 1, 2, and 3). However, group 3 had been the target of a recent federal operation that markedly dampened their violent activity. The remaining two groups were still actively engaging in gun violence.[6]

[6] Dynamics such a those seen in Figure 3 change rapidly and, as such, only capture a "snapshot" of the group violence problem. The reasons for the mismatch in data recorded via group audit versus the rapidly shifting reality of the street is discussed in more detail by Sierra-Arevalo and Papachristos (2015a).

Using such conflict and shooting data in conjunction with data on group membership, location, and violent activity gathered during the group audit and incident review, Longevity personnel were able to identify the most violent groups in the city, and select group members to take part in the intervention.

The Intervention: Group Call-Ins

Using data gathered during the group audit and incident review to guide their selection, Project Longevity staff chose the two most violent street groups to be invited to a *call-in.* Call-ins are meetings between street group members and law enforcement, social service providers, and community members, functioning as an information dissemination tool for the law enforcement-community partnership to deliver three key points to attendees (National Network for Safe Communities 2013):

1. A community moral message against violence;
2. A credible law enforcement message about the consequences of further violence; and
3. A genuine offer of help for those who want it.

New Haven's first call-in took place in November 2012, shortly after the initial problem analysis. Members from two street groups identified as the most violent as determined from the audit and incident review were invited to attend. On the day of the call-in, members from each group were called in to listen to the message given by the Project Longevity partners.

Meeting in the aldermanic chambers housed in New Haven's City Hall, attendees listened to the Longevity message over the course of an hour, hearing from law enforcement, social service providers, and community members. Representatives from law enforcement spoke to attendees first, making sure to articulate the "new rules" (National Network for Safe Communities 2013:76) being implemented to address street group violence. Speakers reiterated that those who continued to engage in gun violence (and their group) would meet with focused law enforcement attention, and highlighted the cooperative commitment of local, state, and federal law enforcement agencies to making the violence stop.

Next, social service providers showed call-in attendees that there is help available to those who want it. Services offered in the New Haven call-ins included housing assistance, high school diploma or GED classes, job training, and drug or alcohol recovery.

Lastly, community representatives acted as "moral voices" known to and respected by the call-in attendees. Leveraging the power of *informal* social control (Sampson 1986; Sampson and Laub 1990; Sampson, Raudenbush, and Earls 1997), community members articulated to attendees the anti-violence message of the program, drawing on their unique positions within the community to help attendees connect with the message. For example, a formerly incarcerated speaker reflected on the choices that led to his imprisonment, and offered testimony that change and a life away from guns and the street life is possible. Another community voice, referred to

sometimes as a "voice of pain," was the mother of a victim of gun violence, her words concentrating on the tragic costs of street violence.[7]

Subsequent call-ins continued to reach out to the other violent groups in the city and between November 2012 and June 2014, with a total of six call-ins. The format of the call-ins remained consistent across this time.[8] If and when there was a law enforcement action against a violent group that had attended a previous call-in, that law enforcement action was showcased to call-in attendees as proof positive that the message they received was real, and that continuing to engage in violence would have swift and certain consequences.

EVALUATION DESIGN

In an ideal study, the implementation of Longevity would have allowed for a quasi-experimental design that compared the rates of shooting incidents between a treatment group and some comparison group (Braga, Hureau, and Papachristos 2014; Papachristos and Kirk 2015)}. Such a within-city comparison of either groups or neighborhoods would allow us to discern whether the rate of shootings of those groups or communities who took part in a call-in differed significantly from those groups and communities that did not. However, Project Longevity was never designed as a quasi-experiment. Because of the concentration of gun violence within a small number of active street groups and within a small number of geographic neighborhoods, Longevity was designed as a non-randomized and highly-focused effort that selected groups because of their involvement in gun violence. This meant that the project staff had little choice but to "treat" nearly all of the groups identified in the group audit process. As a result, within the first year of implementation, virtually all of the identified groups in New Haven participated in at least one call-in, thereby leaving no comparison groups.

The inability to have a true experimental design is a common limitation in gun violence programs, including other GVI evaluations (Braga et al. 2014; Engel, Corsaro, and Tillyer 2010; Engel, Tillyer, and Corsaro 2013) To analyze crime trends *within* New Haven before and after the start of Longevity, we employ a series of interrupted time series regression models (e.g. Braga, Kennedy, Waring, et al. 2001) designed them to address three possible confounding factors that, in light of our design, might bias our results: (1) a general violent crime decline, (2) a general group related criminality, and (3) imperfection in the GMI identification process used by police.

Data

Data used in the present study were derived from fatal and non-fatal shooting records collected by the New Haven and Hartford Police Departments between January 2011 and April 2014. Data were aggregated to monthly counts, creating a 40 month time series for both cities. Project Longevity was active in New Haven during the last 18 months of the observation period,

[7] For a much more thorough description of the call-in, see Crandall and Wong (2012).
[8] The location of the call-in did shift during this period, moving from the aldermanic chambers to the basement meeting room of neighborhood churches. The structure and content of the call-in itself remained constant.

starting November 2012 and continuing through April 2014. Given the specific focus of Longevity on gun violence driven by the small population of criminally-active street group members, the project aimed at addressing shootings and homicides that were group member involved (GMI) – that is, fatal and non-fatal shootings police identified during shooting reviews as involving street group member as a victim or offender. All analyses are therefore conducted on total, GMI, and non-GMI shootings.

If Project Longevity is associated with a reduction in GMI shootings in New Haven, then it would be expected that the number of incidents after the start of the intervention would be lower than before the implementation of Longevity. Additionally, the observed effect of the Longevity intervention would be larger for GMI incidents than for non-GMI incidents in New Haven. Finally, because Longevity was active in New Haven but not Hartford during the observation period, any observed changes in New Haven associated with Longevity should be greater than trends in GMI incidents in Hartford over that time period.

Analytic Strategy

Taking into account the temporal nature of the data, we employ a series of AutoRegressive Integrated Moving Average (ARIMA) models which account for temporal dependencies of time series data. In our analysis, the main dependent variable is the number of shootings as a function of the treatment period. Our models include an autoregressive parameter (Ar1 [ARIMA(1,0,0)], since data showed temporal autocorrelation at one month after the treatment (Total: ACF1= .47; GMI: ACF1 = .77). When the number of shootings is regressed on itself with a time lag of one month no stationarity issues are observed, confirming one of the assumptions required for use of ARIMA models (Total: ADF= -3.70, p=0.038; GMI: ADF= -3.59, p=0.046). [9]

The study design and modeling strategy are not without limitations. In particular, given Longevity's lack of experimental design, it becomes difficult to discern if any observed decrease in GMI incidents during the treatment period is directly attributable Longevity, or if it is the result of (1) a generalized decrease in shootings and homicides that extends beyond New Haven, (2) a decrease in the criminality level of New Haven, or (3) a change in the process of categorization of fatal and non-fatal shootings as GMI or non-GMI.

To address the first issue, we use data on shootings and homicides in Hartford, CT a nearby city that did not receive "treatment" to account for general trends that might be occurring within the same state.[10] As described below, both cities experienced downward trends in

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[9] The ARIMA model is written as $\hat{Y}_t = \mu + b_{Tx}Tx + b_1X_1 \ldots b_nX_n + \phi_1Y_{t-1}$, which is Y regressed on itself lagged by one period (t-1), and estimated by ϕ_1. The effect of other parameters (X), including treatment, can be estimated by *b*.

[10] While Hartford was selected to participate in Project Longevity, the program did not begin in the city until April 2014. While our analysis does include April 2014 in the analysis, Hartford's hosted only a single call-in and sustained efforts at continuing them in the same systematic fashion as New Haven ebbed and flowed; no other call-ins in Hartford were conducted during the observation period of this study. As such, we do not consider Hartford to

shootings throughout this period. The extent to which New Haven's shooting rate trajectory significantly differs from that of Hartford provides some evidence of a New Haven-specific effect.

Another series of analyses addresses a second potential issue: the decrease in GMI shootings in New Haven could be part of a New Haven-specific crime decline that is itself unrelated to the implementation of Project Longevity. Shootings and homicides are closely related to the general level of criminality in a city, and are particularly tied to the level of street group activity (Braga, Papachristos, and Hureau 2009). Thus, if a decrease in the level of group criminality is observed during the treatment period, a concomitant decrease in GMI shootings might not be due to the intervention, but to a decrease in group crime. To address this potential issue, we aggregate the number of offenses in New Haven at the month-level, using only those offense for which police records show more than one offender. We then compare trends in co-offending, i.e. group crime, to GMI trends over the observation period. If a decrease in the number of shootings is still observed after controlling for trends in group crime, this decrease is more likely to be related to Longevity's implementation.

Finally, a third issue concerns the way in which shootings and homicides are categorized by police into GMI and non-GMI. Identification of GMI is a complex process, and evolves as patrol officers and investigators develop their investigation on shootings and homicides. Even when a victim is known to not be involved with a street group identified during the group audit, it is not uncommon for the shooter(s) to be unknown. Without this information, police cannot conclusively say that a shooting incident is GMI, and must conservatively list them as non-GMI. As such, it is likely that some of the shootings officially listed by police as non-GMI are *actually* GMI. If this is the case, any analyses exploring the effect of Longevity on GMI incidents as officially categorized by police would be excluding shootings and homicides that *could* be GMI.

To address this potential problem, we construct a more lenient possible-GMI category to compare to the GMI category used in our analyses. Using logistic regression, shootings incidents are predicted to be non-GMI or possible-GMI based on a victim's age, gender, and race, whether the shooting was fatal or non-fatal, whether the suspect was identified, and in which police district the event happened (see Appendix). Based on this model, incidents that closely approximate events that police categorized as GMI but were not *officially* labeled as such are included in the category of possible-GMI. If a decrease in the number of incidents related to this broader measure of GMI is still observed during the time of the intervention, this decrease is not likely due to imperfections in the GMI identification process.

A final set of analyses considers all of these possible issues simultaneously. If a decrease in GMI incidents during the treatment period can still be observed after controlling for the trend in shootings in nearby Hartford, the level of group criminality in New Haven, and variation in the identification process of GMI incidents, then we can much more confidently claim that the observed decrease in GMI shootings in New Haven is due to Project Longevity.

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have received the full Project Longevity "treatment." Regardless, all models were run with and without incidents from April 2014; the results of our analysis are *not* sensitive to the inclusion of these shootings and homicides during that month.

RESULTS

General Trends in Fatal and Non-Fatal Shootings in New Haven

Figure 4 shows the monthly distribution of all fatal and non-fatal shootings in New Haven before and after the start of Project Longevity. In the 22 months leading up to the start of Longevity, there were 11.64 total shootings per month (SD = 4.17), 19.2 percent of which were homicides (*M*=2.23; *SD*=1.63).

Importantly, shootings were trending downward in New Haven even prior to implementation of Longevity: in the 22 months before the first call-in, overall shootings decreased 55.9 percent. Fatal and non-fatal shootings continued to fall after the start of Longevity, dropping to an average monthly total of 7.3 shootings per month (*SD*=3.34) after the first call-in. This decline in total shootings, approximately 4 fewer shootings per month, can be observed for both homicides (Before: *M*=2.23, *SD*=1.63; After: *M*=1.61, *SD*=1.20; t(38)=1.34, p=0.190) and non-fatal shootings (Before: *M*=9.41, *SD*=3.43; After: *M*=5.72, *SD*=2.74; t(38)=3.69, p=0.001).

Figure 4. Monthly distribution of shootings and homicides in New Haven before and during Project Longevity

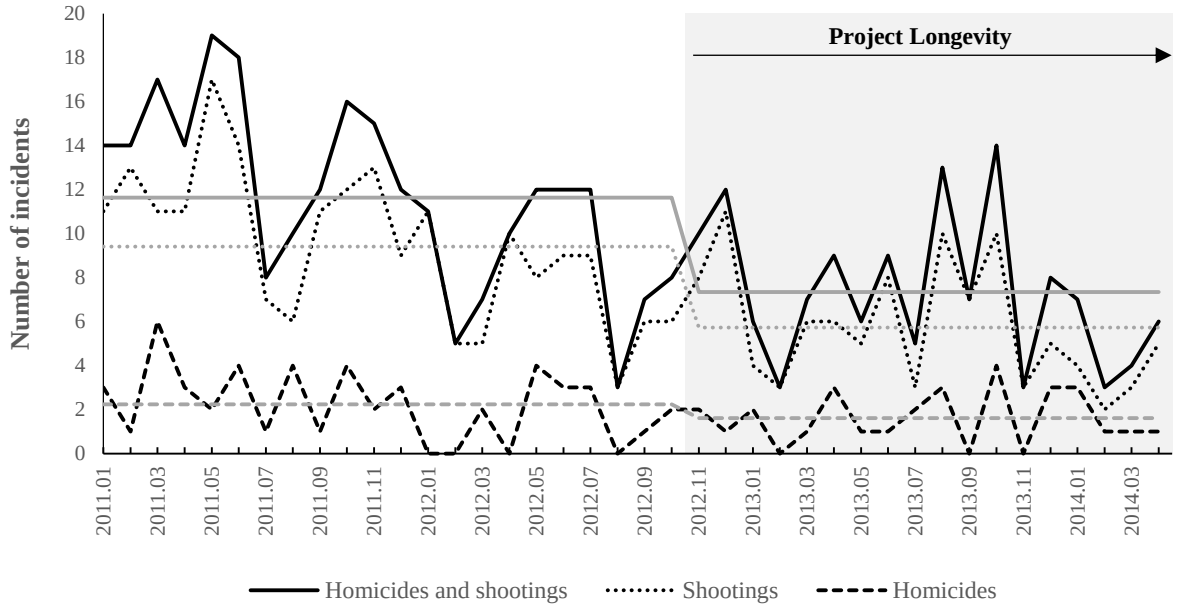
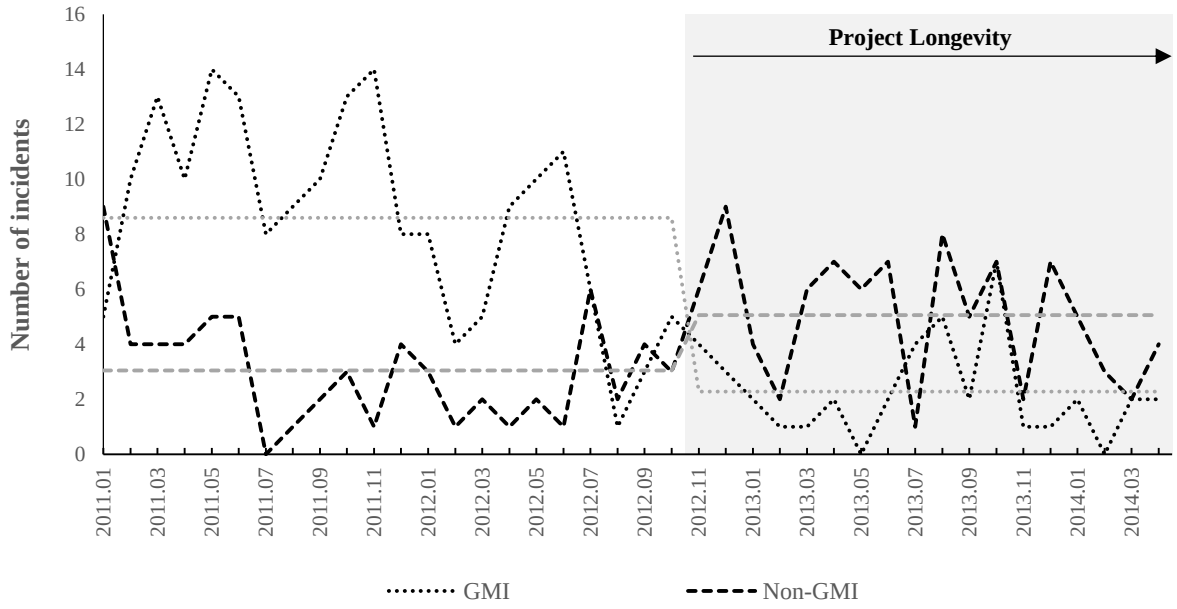


Figure 5 plots the monthly number of fatal and non-fatal GMI shootings before and after the start of Longevity. Approximately 59 percent (*n*=230) of all reported shootings between January 2011 and April 2014 involved a member of a street group as either victim or offender (GMI). Like non-GMI shootings, GMI shootings have, overall, trended downward despite some

peaks during various months. Prior to Longevity, there were an average of 8.59 GMI shootings per month (SD = 1.78); this figure dropped to 2.28 GMI shootings per month after Longevity's first call-in (*SD*=1.78), an almost 73 percent drop in average monthly GMI shootings ($t(38) = 6.63$, $p < 0.001$).

Figure 5. Monthly distribution of GMI and non-GMI incidents in New Haven before and during Project Longevity



At the same time that GMI shootings decreased, however, non-GMI shootings increased approximately 66 percent. *Before* Longevity there were approximately 3.05 non-GMI shootings per month (*SD*=2.08), increasing to approximately 5.06 shootings per month (SD = 2.34) after the first call-in.

The marked decline in GMI shootings after the start of Longevity suggests a negative programmatic effect. As already described, however, because the GMI shootings and homicides were decreasing *before* Longevity's implementation, as well, we must investigate whether the decrease in GMI incidents after the first call-in can be attributed to the intervention, or if it is simply a continuation of a broader trend. To address this first potential issue, we employ interrupted time series regressions to ascertain if the decrease in GMI incidents can be attributed to the implementation of Project Longevity, and not simply part of a general downward trend.

Table 1 presents the results of interrupted time series regressions predicting the effect of Longevity on total and GMI shootings and homicides.[11] Results from time series regressions show that the number of total shootings and homicides decreased by just over 4 during the intervention period. By comparison, GMI shootings and homicides decreased by 5.33 during months in which a call-in was performed.

Table 1. Regression model predicting the effect of Project Longevity on number of incidents per month in New Haven

Shootings and Homicides (New Haven)						
	Total (n=388)			GMI (n=230)		
	b	*SE*	*p*	*b*	*SE*	*p*
Intercept	11.53	1.04	0.000	8.05	1.09	0.000
Ar1	0.28	0.15	0.064	0.50	0.15	0.001
Intervention	**-4.05**	**1.54**	**0.009**	**-5.33**	**1.61**	**0.001**

While these results are suggestive of a programmatic effect associated with Longevity, it is difficult to ascertain if the observed post-Longevity decline is directly related to programmatic efforts without a true experimental design. Additionally, there are at least three alternative explanations or potential issues that might undermine the association between Longevity and the observed post-Longevity decline: broader downward crime trends, the existing level of crime in New Haven, and the definition of what constitutes a "Group Member Involved" shooting. We address each of these in turn.

Possible issue 1: General downward crime trend

As we have already discussed, the lack of treatment and comparison groups within New Haven makes it difficult to pinpoint programmatic effects within the same city. However, an alternative approach to explore whether the post-Longevity decline in GMI incidents is related to program implementation is to compare the trend in New Haven to the trend of comparable cities that did not participate in Longevity. One likely candidate for such a comparison is nearby Hartford, CT.

Hartford is approximately the same size as New Haven with a population of 125,017, and is 39 miles away. More importantly, prior to Longevity both Hartford and New Haven had similar levels of fatal and non-fatal shootings and were both experiencing a downward trend. Figure 6 shows the number of total monthly shootings in both cities before and after the start of Longevity in New Haven. Prior to Longevity, both cities had a comparable number of monthly

[11] For these analyses ARIMA models (1,0,0) were used since data showed temporal autocorrelation at a one month distance (Total: ACF1= .47; GMI: ACF1 = .77), but series can be considered as stationary (Total: ADF= -3.70, p=0.038; GMI: ADF= -3.59, p=0.046).

shootings, although New Haven's rate began trending below Hartford's as early as November 2011—a trend which accelerated after Longevity began. Still, Figure 6 shows the trend of shootings in Hartford is also correlated rather strongly with the trend in New Haven (r=.44, p=0.004).

Figure 6: Monthly distribution of the shootings and homicides in New Haven and in Hartford before and during Project Longevity

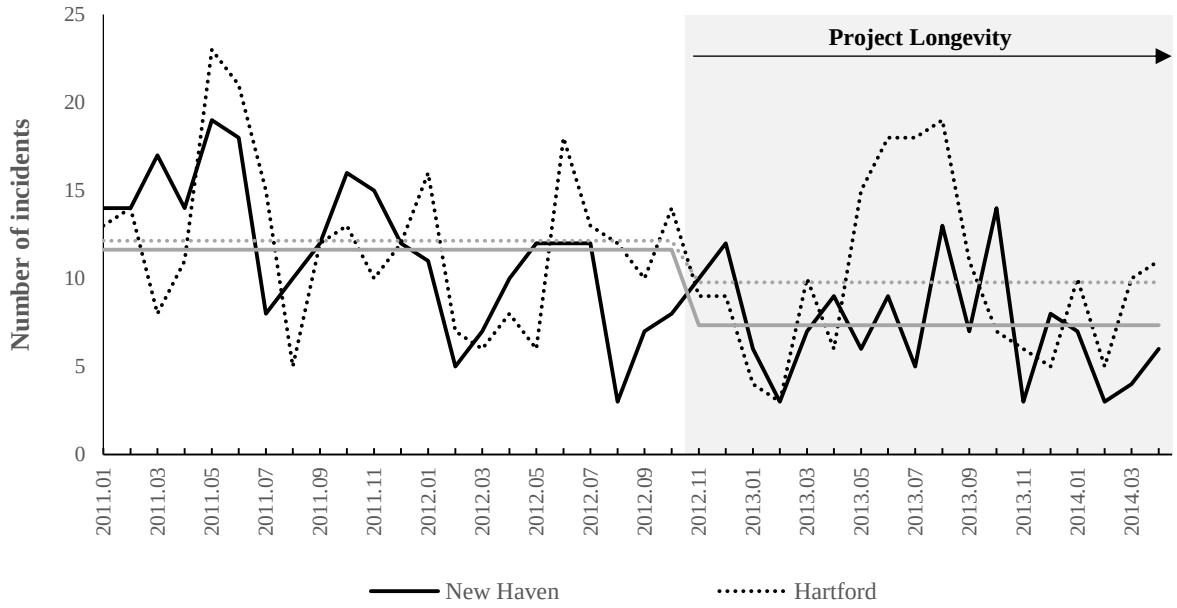


Table 2 shows the same regression model presented in the previous analysis, but this time predicting shootings and homicides that occurred in Hartford. We can observe that during Longevity's intervention period, the decrease observed in New Haven is not replicated in Hartford. Thus, the effect observed during the months of intervention in New Haven was not observed in the nearby city of Hartford. This lends support for our hypothesis that the effect is restricted to New Haven, and is likely due to the implementation of Project Longevity.

Table 2. Regression model predicting the effect of Project Longevity on number of incidents per month in Hartford

Shootings and Homicides (Hartford)						
	Total (n=443)			GMI (n=230)		
	b	*SE*	*p*	*b*	*SE*	*p*
Intercept	12.28	1.46	0.000	8.05	1.09	0.000
Ar1	0.40	0.14	0.005	0.50	0.15	0.001
Intervention	**-2.6**	**2.11**	**0.219**	**-5.33**	**1.61**	**0.001**

Next, we predict the overall level of shootings and homicides in New Haven, as well as GMI incidents specifically, while accounting for fatal and non-fatal shootings trends in Hartford. The results of interrupted time series regressions predicting total shootings and homicides and GMI incidents in New Haven, while controlling for shootings and homicides in Hartford, are displayed in Table 3.

Table 3 shows that while total shooting incidents increased in Hartford, there is also an increase in New Haven across the intervention period, both overall (*b*=0.28, *SE*=0.12, *p*=0.025) and to a lesser degree for GMI incidents (*b*=0.16, *SE*=0.09, *p*=0.079). However, this effect does not explain all of the variation in GMI incidents observed during the intervention period. Even after controlling for shootings and homicides in Hartford, a decrease in GMI shootings and homicides is found New Haven during the intervention period (Total: *b*=-3.47, *SE*=1.36, *p*=0.011; GMI: *b*=-5.04, *SE*=1.51, *p*=0.001).

Table 3. Regression model predicting the effect of Project Longevity on number of incidents per month in New Haven, using Hartford incidents as a control

Shootings and Homicides (New Haven)						
	Total (n=388)			GMI (n=230)		
	b	*SE*	*p*	*b*	*SE*	*p*
Intercept	8.20	1.74	0.000	6.68	1.26	0.000
Ar1	0.21	0.16	0.011	0.48	0.15	0.002
Hartford	0.28	0.12	0.025	0.16	0.09	0.079
Intervention	**-3.47**	**1.36**	**0.011**	**-5.04**	**1.51**	**0.001**

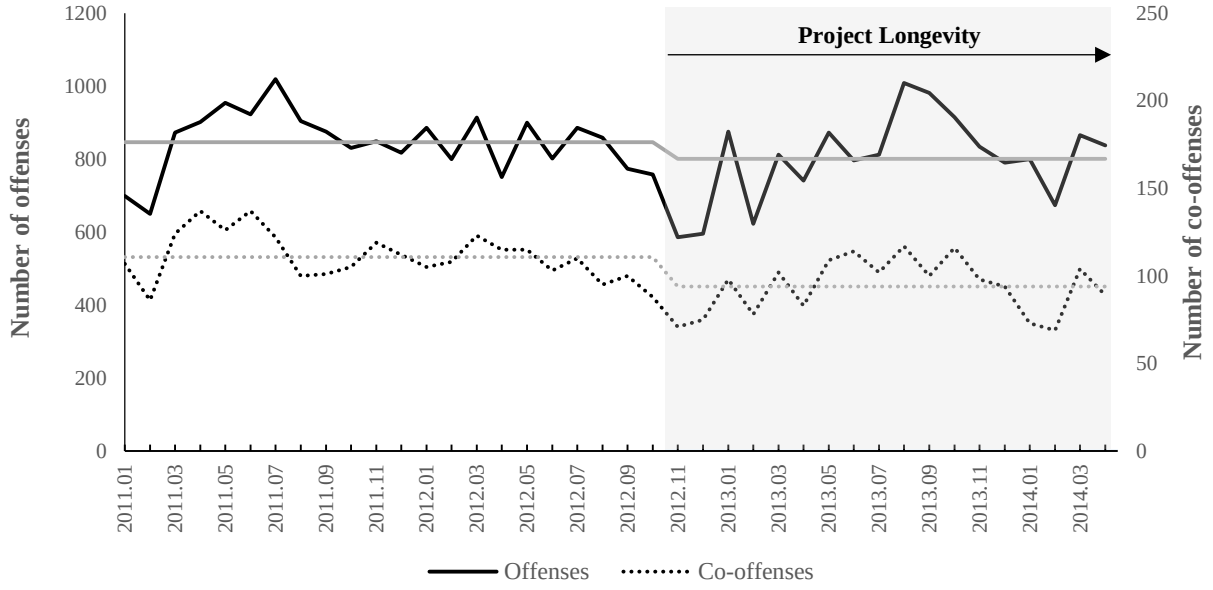
Possible issue 2: Level of Group Offending

The number of shootings and homicides in a city are closely tied to the criminal activity of street groups (Braga et al. 2009). If street group activity *generally* decreases, the observed decrease in GMI incidents might not be related to the implementation of Project Longevity, but instead to a reduction in activity driven by street groups and their members. One way a general decrease in group offending might be affected is through increased law enforcement attention *unrelated to Longevity* that targets street group activities. Although we observed a decrease in total and GMI shootings in New Haven, it is important to assess the extent to which the observed change in GMI shootings and homicides is related to levels of street group criminality.

As a robustness check, we operationalize New Haven's level of street group criminality using police arrest data listing multiple offenders for a single incident—namely, co-arrests. While a crude measure of street group criminality, the group nature of gangs and their activities is well documented (Decker 1996; Klein and Crawford 1967; Reiss 1988) and, as such, the number of co-arrest incidents might provide a crude indicator of New Haven's underlying group crime phenomena. In particular, the leveraging of data on the underlying group processes of crime in New Haven matches up well with the *group* focus of Longevity, as well as the relatively fluid nature of New Haven street groups (see Sierra-Arevalo and Papachristos 2015).

Figure 7 shows the trend of individual arrests and co-offending arrests for the observation period. The individual arrest rate is stable over the observation period (b=-1.00, SE=1.43, p=0.491), suggesting that the overall level of "criminality" in New Haven (or police enforcement) showed little change over the observation period. In contrast, there is a slight but statistically significant decrease in the level of co-offending for each month (b=-0.72, SE=0.20, p=0.001). Prior to Longevity, there were approximately 110.82 (SD=13.84) co-offending arrests per month, but this figure dropped 14.4 percent after the start of the program to approximately 94.00 (SD=15.89) co-offending arrests per month.

Figure 7. Monthly distribution of the number of offenses and co-offenses in New Haven before and during Project Longevity



The monthly number of shootings and homicides in New Haven is not related to individual arrest rates (r=.20, p=0.217), but *is* correlated with the number of recoded co-offenses (r=.52, p=0.001); the relationship is even stronger for GMI defined incidents (r=.59, p<0.001). To parse out the relationship between this co-offending trend and the observed Longevity effect, we estimate a series of models predicting shootings and homicides in New Haven, controlling for the level of co-offending. The results shown in Table 4 suggest that the overall level of co-offending in New Haven has a statistically significant effect on the total number of shootings: an increase of 100 recorded co-offenses is related to an increase of 9 shootings. However, Table 4 also shows a statistically significant intervention effect of Longevity on GMI shootings and homicides, even when controlling for the effect of co-offending. This further suggests that the observed decrease in the number of GMI incidents observed during Project Longevity cannot be completely explained by a decrease in group offending.

Table 4: Regression model predicting the effect of Project Longevity on the number of incidents per month in New Haven using co-offenses as a control

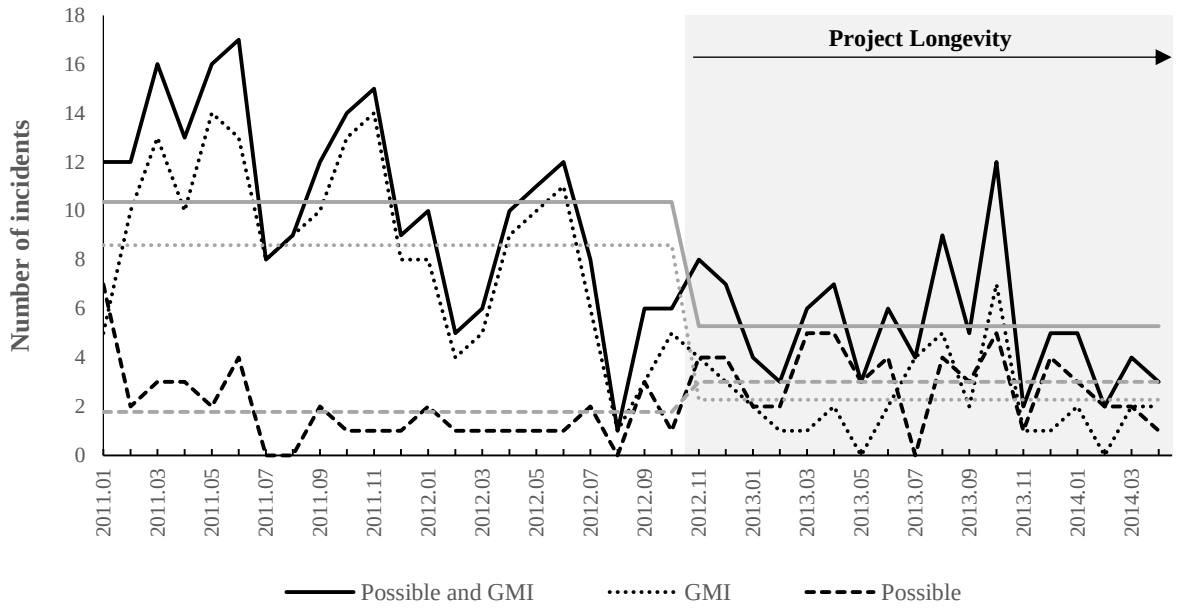
Shootings and Homicides (New Haven)						
	Total (n =388)			GMI (n=230)		
	b	*SE*	*p*	*b*	*SE*	*p*
Intercept	1.65	4.50	0.714	3.16	3.58	0.378
Ar1	0.24	0.15	0.121	0.42	0.17	0.011
Co-offenses	0.09	0.04	0.025	0.05	0.03	0.157
Intervention	**-2.60**	**1.53**	**0.09**	**-4.86**	**1.41**	**0.001**

Possible issue 3: GMI identification

Another threat to the validity of our findings stems from the possibility that our dependent variable is biased by police definition of a shooting as GMI. One could argue, for instance, that a lack of information in ongoing investigations prevented an event from being conclusively identified as GMI during shooting reviews. Such an explanation might explain the observed decline of GMI incidents and the rise in non-GMI shootings. Under such a condition, the observed Longevity effect would be due to GMI identification, and not to a decrease in GMI incidents.

We examine this threat to validity using a logistic regression that attempts to identify *possible*-GMI shootings based not on police identification during shooting reviews, but instead on the demographic characteristics of the victim (race, age, gender), the identification of the suspect, the presence of homicide, and the location of the shooting (see Appendix).. This strategy identified 323 possible-GMI incidents – 93 more than were identified as GMI by police during the shooting review process. Figure 8 compares the trend in this newly created possible-GMI category with the pattern of police-identified GMI incidents.

Figure 8: Monthly distribution of the number of offenses and co-offenses in New Haven before and during Project Longevity



To further investigate this issue, we subject the police-defined GMI and possible-GMI trend to the same time series regression models described above to determine the effect of Longevity on these two formulations of GMI. Table 5 shows that, even when including the 93 additional cases of possible-GMI incidents with the police-identified cases, we detect a statistically significant decrease in the number of incidents after the start of Longevity. Even with a more lenient identification of GMI, there is a significant negative programmatic effect of Longevity on GMI shootings and homicides.

Table 5: Regression model predicting the effect of Project Longevity on number of incidents identified as possible-GMI per month in New Haven

Shootings and Homicides (New Haven)						
	GMI (n=230)			Possible-GMI (n=323)		
	b	*SE*	*p*	*b*	*SE*	*p*
Intercept	8.05	1.09	0.000	10.20	0.93	0.000
Ar1	0.50	0.15	0.001	0.31	0.14	0.027
Intervention	**-5.33**	**1.61**	**0.001**	**-4.94**	**1.26**	**0.001**

Multiple Explanations & Summary Model

As a final robustness check, we take into account the three threats to validity we have thus far discussed and control for them in a single model. Table 6 presents the results from a series of models predicting total shootings and homicides, GMI (as defined by police), and possible-GMI shootings that use the shooting trend in Hartford and the level of co-offending in New Haven as statistical controls. The results find a continued, but somewhat reduced, Longevity effect when controlling for these additional parameters. As seen in the last row in Table 6, even after controlling for these additional parameters, the implementation of Project Longevity is associated with 2.4 total shootings (fatal and non-fatal) per month, 4.6 fewer GMI

incidents, and 3.1 fewer possible-GMI incidents after the start of the program. While such an analysis still lacks true causal power, the robustness of the observed intervention effect to different statistical conditions and parameters strongly suggests that the observed decline in GMI shootings and homicides in New Haven can be attributed to the enactment of Project Longevity.

Table 6. Regression model predicting the effect of Project Longevity on number of incidents per month in New Haven, using Hartford incidents and New Haven co-offenses as controls

Shootings and Homicides (New Haven)

	Total (n=388)			GMI (n=230)			Possible-GMI (n=323)		
	b	*SE*	*p*	*b*	*SE*	*p*	*b*	*SE*	*p*
Intercept	0.88	4.32	0.839	2.34	3.45	0.498	-0.18	3.98	0.963
Ar1	0.21	0.16	0.170	0.44	0.16	0.007	0.28	0.16	0.068
Hartford	0.22	0.12	0.069	0.14	0.09	0.137	0.14	0.11	0.196
Co-offenses	0.07	0.39	0.066	0.04	0.03	0.22	0.08	0.04	0.028
Intervention	**-2.38**	**1.45**	**0.101**	**-4.58**	**1.44**	**0.001**	**-3.12**	**1.42**	**0.029**

CONCLUSION

Project Longevity represented a focused deterrence effort aimed at reducing gun violence in New Haven, CT. Emulating previously evaluated programs from other cities (e.g. Braga, Kennedy, Waring, et al. 2001; Braga et al. 2013; Corsaro and Engel 2015; Engel et al. 2013; Papachristos and Kirk 2015; Papachristos et al. 2007), Longevity performed call-ins with street group members between November 2012 and April 2014 to leverage group dynamics and curb the violence on New Haven streets. In these call-in, a combination of law enforcement, social service providers, and community-members spoke with street group members to deliver a unified message to group members that the gun violence must stop, there is help for those who want it, and those who choose to continue committing acts of violence will meet with swift legal consequences (Crandall and Wong 2012; National Network for Safe Communities 2013).

To test whether Project Longevity had a significant, negative effect on group member-involved (GMI) shootings and homicides in New Haven, we examined data on lethal and non-lethal shootings in the city from January 2011 until April 2014 using a series of Autoregressive Integrated Moving Average (ARIMA) models. The results of our analysis suggest that, even accounting for a variety of alternative explanations, the implementation of Project Longevity in New Haven, CT was associated with a reduction of nearly 5 GMI shootings and homicides per month. These results support a growing body of empirical research that confirms the efficacy of focused deterrence strategies for reducing gun violence in American cities (for a review of the growing list of cities, see Braga and Weisburd 2012, 2015). Moving away from traditional deterrence and broken windows approaches that privilege broadly applied police sweeps or enforcement of minor offenses, New Haven's Project Longevity is one more instance of how targeting *specific* offenders, in this case members of violent street groups, can significantly enhance public safety.

To be sure, the design of Project Longevity is not ideal for programmatic evaluation. As we have described, the pressing nature of the gun violence problem and the relatively small number of actively violent street groups identified during New Haven's group audit led to nearly all of the groups being invited to a call-in during the intervention period. Because of this, we are unable to compare the effect of the Longevity intervention on a set of treatment and control groups or neighborhoods as is more common in quasi-experimental designs. Despite this issue with the design of the intervention, we account for three alterative explanations for the observed decrease in GMI shootings and homicides in New Haven: 1) a general decrease in gun violence that extends beyond New Haven, 2) a reduction in group offending patterns, and 3) an imperfect police-defined GMI measure. Even after accounting for these alternative explanations, a significant decrease in GMI incidents after the implementation of Project Longevity in New Haven is observed.

Even accounting for these plausible alternative explanations, we cannot be unequivocally sure that the effects we attribute to the implementation of Longevity might not be caused by unobserved changes during the intervention period, such as in activities by pre-existing social service programs. Before and during the implementation of Longevity, New Haven had dozens of local organizations working on a variety social issues, including job training, addiction services, mental health services, and adult education. In fact, the existing network of social service providers were an integral part of the Longevity strategy, with several local agencies and programs partnering with Longevity. While previous work finds that provision of social services is not responsible for the observed declines in gun violence attributed to focused deterrence initiatives (Engel et al. 2013), we cannot conclude that the observed Longevity effect does not overlap with other unmeasured programs, policies, or services.

We believe that our results bolster an already strong case for future implementations of focused deterrence strategies in cities across the U.S., especially similar medium-sized cities that are less likely to have their gun violence problems discussed in the same breath as metro areas like Chicago, Los Angeles, or Indianapolis (McGarrell et al. 2006; Papachristos and Kirk 2015; Tita et al. 2010). Similar to other smaller cities like Rockford, IL (Corsaro, Brunson, and McGarrell 2013) and Lowell, MA (Braga, McDevitt, and Pierce 2006), the results of New Haven's Project Longevity indicate that focused deterrence strategies can effectively bolster public safety outside of big city contexts, and suggest that the underlying street group dynamics that drive gun violence are not unique to major city centers.

However, as discussed in previous evaluations of focused deterrence initiatives (Braga, Kennedy, Waring, et al. 2001), each city in which such a strategy is implemented faces a unique set of challenges and, hopefully, solutions to said challenges. While the underlying logic of the focused deterrence strategy is relatively stable between sites, the implementation of the strategy is necessarily adapted to the unique geographic and political context of each city. Taking into account the variation between cities, we echo calls by other scholars (e.g. Braga and Weisburd 2015) and suggest that the success of Project Longevity in New Haven, CT should spur not only the adoption of focused deterrence into the public safety repertoires of other cities, but also a deeper exploration of the underlying mechanisms and group processes that generate "spillover

effects" of focused deterrence strategies (Braga, Apel, and Welsh 2013). Knowing that the structure of street groups is not consistent across cities (McGloin 2005; Sierra-Arevalo and Papachristos 2015b), how focused deterrence strategies operate through variable group structures is an important consideration when considering the expansion of programs like Project Longevity to other cities.

With New Haven as only the first of three cities that are part of the statewide Longevity plan, Connecticut is a promising place to continue the study of focused deterrence strategies' effects on gun violence, as well as their implementation. Though Hartford and Bridgeport are 20 and 39 miles from New Haven, respectively, and each city has gun violence in need of attention, each city also has a unique constellation of law enforcement, service providers, community members, and street groups. How these differences in the context of where a focused deterrence strategy is carried out affect the implementation present a promising area for future research to explore, with such research providing useful information for law enforcement, communities, and policy makers alike as they work together to reduce urban gun violence.

Keeping these future avenues of research in mind, our findings provide evidence that focused deterrence strategies like Project Longevity are a viable and efficacious step away from overly broad policies and policing practices such as stop and frisk or police sweeps. With public, academic, and policy-making attention firmly trained on the need for change in how the criminal justice system acts on the lives of community residents, an approach that funnels limited resources towards those most likely involved in gun violence as victims and offenders provides a promising way forward. Though such programs are not perfect panaceas for the underlying issues that engender gun violence – ineffectual schools, broken homes, unemployment, poverty – they are at the very least an effective way to address the gun violence that is symptomatic of these broader social ills, all while minimizing the number of community members caught up in the criminal justice system.

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Appendix A

Logistic regression predicting GMI shooting according to the characteristics of the incident to identify possible-GMI incidents

	B	*S.E.*	*Exp(B)*	*Sig.*
Homicide	-0.29	0.29	0.75	0.319
Race (ref : White)				
Latino	0.00	0.48	1.00	0.998
Black	0.26	0.37	1.3	0.474
Gender : Male	0.56	0.46	1.74	0.224
Age	0.04	0.13	1.04	0.775
Age^2	0.00	0.00	1.00	0.423
Age^3	0.00	0.00	1.00	0.272
Police District				0.463
District 1	0.05	0.63	1.05	0.934
District 2	0.24	0.52	1.27	0.646
District 3	0.5	0.44	1.65	0.261
District 4	0.35	0.46	1.42	0.446
District 5	0.17	0.53	1.18	0.751
District 6	-0.22	0.56	0.8	0.695
District 7	0.28	0.39	1.33	0.474
District 8	0.05	0.41	1.06	0.897
District 9	-0.76	0.5	0.47	0.132
Suspect known	1.04	0.26	2.82	0.00
Constant	-0.46	1.48	0.63	0.758
			-2LL : 557.5; Pseudo R^2 : .12	

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