A Community-Based Systems Learning Approach to Understanding Youth Violence in Boston

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Abstract

**Background:** Youth violence in general and gang violence in particular continues to be a pernicious problem facing the majority of large U.S. cities. Attempts to reduce youth violence are hindered by the absence of a shared framework that crosses multiple disciplines.

**Objective:** The goal of the Youth Violence Systems Project (YVSP) is to help communities strategize for and achieve sustained reductions in youth violence in Boston.

**Methods:** A distinction of YVSP is the engagement of community residents in a group model building process to develop a conceptual framework and create a system dynamics computer model of youth violence in Boston. Community residents including youth participated in the design, execution, and evaluation of the project. We also partnered with community agencies to gain insight from individuals with a history of gang involvement or violent offense. The computer model highlights the dynamics of movement into and out of gangs, and the relationships that influence violent interactions among individuals and gangs. The model serves as a simulation-based laboratory for examining initiatives aimed at reducing youth violence within a community. It considers the positive feedback between traumatic stress and violence; as violence levels rise in the community, this increases individual traumatic stress, which further increases violent responses by community members.

**Conclusion:** The project’s community-based approach coupled with its system dynamics methodology produced a new understanding of youth violence in Boston. This understanding undergirds the model’s logic, making it more useful to community residents and more accurate in describing the behavior of youth in high-violence neighborhoods.

**Keywords**
Youth violence, systems theory, system dynamics, computer modeling, gang culture, community-based participatory research

Youth violence in general and gang violence in particular continues to be a pernicious problem facing the majority of large U.S. cities. Although levels of youth violence have declined since peaking in the mid 1990s, the percentage of homicides involving a gun has increased since 2000. The problem is more pronounced for black males who have experienced a 54% increase in homicides between 2002 and 2007, making homicide the leading cause of death for black males ages 10 to 24. Most initiatives to reduce youth violence continue to operate in isolation, despite findings that cities that employ more coordinated efforts have lower rates of youth violence. Although numerous youth violence task forces have been established, they seldom include noncriminal justice partners. Some in the public health community have suggested the use of a multidisciplinary approach to engage health, justice, mental health, and education in addressing this youth violence epidemic, but attempts at collaboration are hindered by the absence of a shared framework.
In an effort to explore the root causes of youth violence in Boston, the Emmanuel Gospel Center and the Boston Capacity Tank convened the YVSP to develop a multidisciplinary framework that can be used by multiple stakeholders. The project steering committee includes representatives from the Emmanuel Gospel Center, the Black Ministerial Alliance of Greater Boston, the Dudley Street Neighborhood Initiative, and project consultants. Academic partners include the Harvard School of Public Health’s Youth Violence Prevention Center and Northeastern University’s Institute on Race and Justice.

OBJECTIVES

The goal of the YVSP is to improve the understanding of youth violence in Boston, and ultimately to help communities strategize for and achieve sustained reductions in violence. This article describes the process used by YVSP to integrate academic, institutional and community perspectives into an organizing framework using socio-ecological theory, and to build a system dynamics computer model to examine the efficacy of violence-reducing strategies in Boston.

METHODS

Computer modeling is common in engineering, economics, and many other disciplines. Although computer modeling has been used to evaluate youth violence in Boston, a distinction of YVSP is the engagement of community residents in a group model building process to create a system dynamics computer model. The system dynamics modeling methodology explores the dynamic behavior of complex systems by modeling the accumulation and flow of discrete variables over time. This process was chosen by the project steering committee because of its ability to facilitate community learning and develop a systems-level, conceptual framework.

Formative Research

We sought to ensure the project would be informed by the literature, culturally relevant, communicated effectively, and respectful of existing community power structures. We conducted a review of literature in criminology, psychology, human development, and mental health on youth violence. We then created four neighborhood briefing documents and assembled an academic–community advisory board. Copies of the literature review and the briefing documents were distributed to the community, and published online at the YVSP website.

Additionally, we conducted 45 in-depth interviews with key community, academic, and public institution stakeholders; 4 focus groups with gang experts, family mental health experts, and survivors of gang violence; and 12 project briefings with community residents, community-based agencies, and academic and institutional stakeholders. Each stakeholder was identified by multiple community members as having a respectful, long-term relationship with neighborhood residents. This input was essential in helping to design a process that was acceptable to both community residents and the institutional and academic partners.

Although we recognized that external risk factors (such as diminished economic opportunities or high concentrations of poor residents) can be associated with higher rates of violence within a community, youth violence in Boston is known to occur in hotspot neighborhoods—distinct multi-block areas that have a higher than average number of criminal violent events. This led us to focus on the processes within a neighborhood that affect violent behavior.

Theories like social disorganization, social efficacy, broken windows theory, and crime opportunity theories have sought to explain differing neighborhood crime levels. Discussions with Boston police officers confirmed findings that most serious youth violence occurred among a small number of gang members who “were constantly on watch for each other and, as a result, carried guns, used guns, and acted tough.” We therefore chose to view youth violence as a systems problem, driven by the dynamic interplay of multiple actors with disparate goals and priorities.

The Group Model Building Approach

Understanding that community residents have local knowledge and expertise about neighborhood dynamics and violence prevention, we concluded that input from community residents was needed to understand community-based youth violence. We created a process to help residents capture this knowledge by participating in the design, execution, and evaluation of the project. This approach was welcomed, with one participant declaring, “You’re asking me what I think creates the violence cycle? Now that’s a first. Usually outsiders
Concept maps were used to represent the relationships that drive youth violence within a community and to provide a visual record of corporate thinking. Maps were developed in conversation with community members to describe connections between youth violence behavior, the context in which this violence occurs, the institutions that influence this context, and potential catalysts that may drive behavior.

Figure 1 describes residents' understanding that:

- the violent behavior of youth could be attributed to gang violence (accounting for the vast majority of serious violence including youth homicides) and other, less serious non-gang violence;
- this violence is contextualized to the community, culture, and personal predisposition of youth;
- the context in which violence occurs is influenced by social institutions, family, peers, and public institutions; and
- traumatic stress serves as catalyst, which may drive behavior in the system.

By providing a value-neutral focal point for discussion, the diagrams helped community members to effectively communicate their understanding of the forces that drive violence.

Vennix describes the group model building process as a way to facilitate team learning using system dynamics modeling. We adapted this approach to integrate the perspectives of community residents with academic research and institutional data.

Design teams were convened in 3 neighborhoods (Uphams Corner, Grove Hall, and Bowdoin-Geneva) to oversee the development of the core logic and framework. They worked in close collaboration with a computer model builder to translate findings into visual diagrams and into a computer model. Each design team regularly reviewed, tested, and approved the computer simulation model throughout its development.

Each design team was assembled with the assistance of 3 community partners. Each partnering agency selected 4

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Figure 1. Concept Map: Factors Affecting Youth Violence
individuals to participate in the design team (2 adults and 2 youth who were community residents) for a total of 6 adults and 6 youth on each team.

The inclusion of youth in the design teams was an important part of the process. This provided tremendous insight into the behaviors and motivations of community youth. The process was also perceived as respectful to the community because a significant amount of effort was invested in developing trusting relationships. Furthermore, it provided accountability, which is crucial in leading sustainable community transformation.

Hard-to-Reach Focus Groups

During the group model building process, community residents expressed sentiments that—despite their proximity and familiarity with community violence—they knew very little about the behavior and motivations of those perpetrating violence. As a result, we realized the necessity of conducting primary research with gang members and violent offenders.

We partnered with community-based agencies experienced with gang work to identify and engage key individuals in the project. It was decided that it was necessary to talk with young, active gang members as well as older and in some instances founding gang leaders to get a comprehensive picture of the structure and dynamic behavior of gang members. Two focus groups were formed, the first consisting of gang members ages 18 to 23, and the second consisting of men ages 22 to 40 with a history of gang involvement or violent offense. Participants were hired as consultants and tasked with providing information about the methods and rationale for youth violence based on their own experiences.

Group reflective listening along with individual and group observations were used to gather information in the form of verbatim quotations and observation notes. In addition to co-facilitating the sessions, partner agency staff and consultants assisted in evaluating and interpreting the data.

Description of the Framework and Inputs Into the Model

Stock/flow diagrams were used to develop a framework for youth violence, which describes the dynamic movement of

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* In the language of systems dynamics, “stocks” are the places where items accumulate (in this model, number of youth) and “flows” are the mechanisms by which stocks are increased or depleted. See, for example, “An Introduction to Systems Thinking, iThink” (Barry Richmond, isee systems, 2004).

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![Diagram](image-url)
youth in their involvement with community-based violence. Design teams discussed and reviewed the diagrams, modifying them as needed to more accurately reflect team members’ understanding of how violence occurs in their neighborhoods. Through the use of these diagrams, multiple stakeholders were able to communicate with one another in sophisticated ways about youth violence, regardless of age, culture, background, or discipline.

Figure 2 shows the stock/flow diagram for youth violence with the youth population in a community segmented into a set of 13 categories. Each category represents a subset of the youth population as it relates to gang subculture. "Uninvolved," "associate," and "on the edge" constitute non-gang categories. The $3 \times 3$ category matrix represents gang subculture categories.† "Incarcerated" describes those youth who are in jail, prison, or a detention program.

Over time, there is potential for youth to move between the different categories (e.g., from "uninvolved" to "on the edge"). Specific pathways of movement were identified through discussions with project participants. Each pathway represents a potential place for system intervention. The process by which youth move downward into violence is described as "slippery slope" dynamics.

The framework considers the shifting identities and behaviors of youth as they become involved in violence. It provides the core logic for the computer model which serves as a simulation-based laboratory for examining initiatives aimed at reducing youth violence within a community.

The findings of the gang member focus groups suggest that gang involvement represents a radical shift in identity. Gang members describe a subculture in which identity and belonging are reinforced with violence, making it extremely difficult for certain youth to leave gang membership.

This violent subculture displays an abnormal relationship with violence in which gang members report using violence as a dominant mechanism for managing emotional well-being.‡ Gang members also describe trauma experienced as a result of their own acts of violence against others. Individuals recounted experiencing extreme fear, uncontrollable shaking, flashbacks, and in some cases blacking out associated with the first time they personally shot at someone. This suggests that initial acts of violence may lead youth down a path of increasingly violent behavior that is reinforced by self-induced traumatization.

At the beginning of the project, it was assumed that the majority of youth in high-violence neighborhoods were uninvolved with gang violence because research showed that community violence was being committed by a "small number of chronically offending gang-involved youth." Discussions with youth from high-violence neighborhoods revealed, however, that most identified themselves and their peers as having a significant number of conspicuous relationships with gang members. This suggests that a complex network of relationships exists between violent and nonviolent youth in high-violence neighborhoods.

Rich and Grey discuss how high levels of traumatic stress for victims of violence may contribute to recurrent interpersonal violence for victims. Community residents, however, describe how the ever-widening ripples of impact from each violent event contribute to heightened levels of traumatic stress for non-victims as well. It seems, then, that the violent behavior of youth in Boston is a place-based phenomenon that is driven in part by higher than normal levels of traumatic stress in high-violence neighborhoods.

The Computer Model

The ISEE systems STELLA system thinking software package (Lebanon, NH) was used to build the computer model. The model seeks to provide a physical basis for the generation of violence among youth. Focal areas within the model include slippery slope dynamics, community trauma, and youth affin-
ity for violence. The model uses these focal areas to determine the frequency of high risk interactions and violent activity within and across the 13 categories. Figure 3 provides a highly simplified representation of the model’s logic.

Slippery Slope Dynamics. The model treats in detail the dynamics of movement into gangs and the relationships that influence violent interactions among individuals and gangs. Default movement rates are reflective of macro-system influences such as job availability and levels of neighborhood poverty. These rates can be calibrated to model the effects that different social influences may have on communities of interest. By speeding up or slowing movement between categories, it is possible to capture the impact of real-world initiatives that alter the long-term distribution of youth along the slippery slope. The distribution of youth across the different categories determines how the annual frequency of high-risk interactions is calculated, the likelihood that an interaction will result in violence, and the likelihood that a violent interaction will involve guns.

Community Trauma. Traumatic stress is both a result of and a precursor to violence, and is experienced as violence levels rise within a community. The model uses the concept of community trauma to model the positive feedback between traumatic stress and violence. As violence levels rise in the community, this increases individual traumatic stress, which increases the frequency of high-risk interactions between community members, leading to further increases in violent behavior.

Affinity for Violence. The model uses the concept of “affinity for violence” to capture the impacts of individual trauma that accrues to those engaged in violence. For these individuals, violence drives the growth in affinity for violence, which subsequently increases the likelihood that a high-risk interaction will result in violence.

The model interface enables exploration of initiatives focused on slippery slope dynamics, the generation of violence, as well as on trauma dynamics. In the current version of the model (v. 1.09), configuration of experiments is accomplished through a set of switches. Figure 4 illustrates the modeling of a 4-year initiative aimed at reducing the rate that “on the edge” youth are recruited into gangs and increasing the rate of incarceration of gang members by 20% compared with baseline.

**Figure 4. Illustrative Intervention**

In this model run the following intervention strategies (represented by the switches in the up position) are selected: (1) Reduce rogue entry; (2) reduce less organized gang recruiting; (3) reduce more organized gang recruiting; and (4) clear the streets.
This configuration is then tested through a 12-year simulation run. Results can be viewed in isolation on a simulation dashboard, or as a set of comparative graphs and tables of key output metrics. The model projects the distribution of youth among the 13 behavioral categories over time. This distribution is used to calculate an estimation of community trauma, youth related gun violence, and youth related other violence over the simulation run.

Figure 5 shows a drop in community trauma after a 3-year delay and an increase corresponding to community violence in year 6. It also shows a drop in youth gun violence and other violence after a 2-year delay that bottoms out in year 6 and begins to rise and eventually settles at a lower baseline by year 12. By analyzing different scenarios through multiple model runs, the model provides a tool to focus discussions among stakeholders around the relative efficacy of prevention, mitigation, and intervention strategies.

LESSONS LEARNED

Community-Based Participatory Research Acknowledges and Learns From the Past

It should be understood that all community-based initiatives occur within the context of the community’s historic relationship with similar projects. In addition to developing critical analytical skills, community residents develop a clear perspective regarding what types of collaborative relationships are useful for their communities. This project benefited from listening carefully to these perspectives and respecting the diversity of skill and motivation within the community. The project avoided a number of potential pitfalls by listening closely to community residents and learning from their assessment of previous initiatives.

When a complaint was raised by residents regarding a previous initiative’s failure to respect community opinions, we decided to place the final model design authorization with community-led learning teams instead of the model builder or project steering committee. This helped to establish credibility early on within the community and helped to overcome the resistance to “outside-in” approaches.

We also learned from the failure of a previous project to “go deeper with gang members.” Upon partner consultation, the project team adopted a very direct, interpersonal approach to inquiry design that increased our ability to generate primary data about the rules, norms, behaviors, and motivations of gang members. For example, based on this input we asked gang members to describe their initial and ongoing experiences perpetrating gun violence. They described their use of violence to “release tension” associated with grief or abating generalized anger, “forcing” conflict with others for personal reasons, and feeling a “rush” and sense of time slowing down during initial experiences with gun violence. This suggests that the presence of a subculture with fundamentally different behavioral norms may explain why some initiatives have results that differ from expectations when attempting to modify the violent behavior of gang members. Practitioners with extensive gang expertise (such as law enforcement and youth workers) may have unique insight into the behavior of this subculture and should be consulted to help design the most effective interventions.

‡ A 12-year simulation run was selected to evaluate long-term behavior and optimize the calculation and display behavior of the software application.
Successful Partnership Requires Considerable Effort

As trust grew over the course of the project, community residents became more open in sharing their unique, valuable insights into youth violence. In many cases, residents had devoted significant thought to the problem; however, drawing out these insights required the use of effective listening methods. Ultimately, it must be understood that respectful treatment of community residents requires acknowledging that they are capable of participating in problem definition, analysis, and solution creation. And that this understanding is rooted in the awareness that communities do not exist as monoliths, but contain a diversity of perspective, capacity, ability, and motivation. This is especially true of the deep and meaningful insights that can be gained by understanding the opinions of youth.

Successful partnership treats each partner with respect and allows each participant to contribute from their area of expertise. In this process, we have tried to meet the definition of successful partnerships by including a broad array of agencies in the development of the model. Although the commitment to develop a sustainable relationship with community residents took twice as long as originally planned, this type of partnership is more fulfilling for groups who often serve as a source of information for academic research but are seldom included in what information is analyzed or presented.

CONCLUSION

This project employed a community-based participatory research process in which residents participated in the design, execution, and evaluation of a detailed, system dynamics computer model of youth violence in Boston. Community residents, from agency leaders to youth to gang members, provided unique insights into the behavior of violent youth in Boston. Their empowerment and engagement in a community-driven process fostered a collaborative environment in which the logic of community residents could be articulated and explored.

The use of a group model-building process to codify this logic into a system dynamics model created enthusiasm from community residents because they saw their own logic reflected in the evaluation of violence-reducing initiatives. The project’s community-based approach coupled with its system dynamics methodology produced a new understanding of youth violence in Boston. This understanding undergirds the model’s logic, making it more useful to community residents and more accurate in describing the behavior of youth in high-violence neighborhoods.

Sterman notes that the process of model testing and improvement is iterative. The current phase of the project (April 2010 through December 2011) will deepen our relationships with current participants and expand to a broader community as we continue to test and develop the model as a useful tool for facilitating the reduction of youth violence in Boston. Specific activities in this phase include:

- Refine the model based on community input;
- Train and support 50 community agencies to apply the model to their situation and interests;
- Partner with 3 to 5 community agencies to foster ongoing learning about the system of youth violence;
- Train and support 200 youth workers to understand and use the model;
- Convene 2 community and 1 academic forums; and
- Tailor the model to describe a typical high-violence neighborhood in Boston.

Our goals for this phase are to gain deeper insight into the root causes of youth violence, create a broader conversation about these root causes, help people to see where they fit into the framework, discern what is missing, and increase the dialogue about what strategies are needed.

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REFERENCES