



THE YVSP STRATEGY LAB

Steve Peterson

The Youth Violence Systems Project (YVSP) was initiated to empower the community's perspective on youth violence in Boston by creating a framework for developing intervention strategies that lead to real change. Since 2008, YVSP has been using a community-based approach coupled with systems dynamics modeling to create a virtual laboratory to model youth violence intervention strategies. Our goal is to help develop the capacity for deep and honest dialogue among a wide range of people to collaborate toward a shared goal of reducing youth violence in our neighborhoods.

This article describes YVSP's system dynamics model in detail, including an introduction to the key systems concepts for understanding the model. In addition, the story of the YVSP process is further told in three related articles:

- **The Youth Violence Systems Project: A Community-Based Framework of Understanding Youth Violence in Boston** gives an overview of the community-based process that is at the heart of YVSP. It also gives a brief introduction to the content covered in more depth in the other three articles.
- **The Reason Why We Haven't Solved the Gang Violence Problem** discusses how the YVSP team solicited the input of gang members in the design process, and describes the findings and insights gained.
- **What We Are Learning** describes how the model is being used in various settings, and what different folks are learning from the discourse so far.

You're going to build a what?

The YVSP Strategy Lab is a computer simulation model that captures key interdependencies that underwrite violence among youth in Boston communities. It represents a significant investment of time, energy, and expertise over a long period of time. Yet, if you're thinking about youth violence, it is probably the case that a dynamic model is not the first thing that will come to mind. Why bother building a simulation of youth violence? What's the benefit of developing and using a computer simulation?

As it turns out, there are two important sets of reasons for building this model. The first set of reasons relates to the nature of the problem itself. The second relates to the community process that can be supported through development of the model.

Youth Violence is a Systems Problem

Youth violence is a pernicious problem that faces many large US cities. Within the US, for example, homicide is the leading cause of death for African American males aged 10-24. This problem is very difficult to unpack, understand, and ameliorate using traditional

tools and processes. In high-violence communities, the problem has stubbornly resisted efforts aimed at improving the situation.

Part of the challenge here is that youth violence is a *systems problem*. Systems problems are inherently challenging, primarily because of their essential characteristics [see sidebar]. Like other systems problems (you might take a moment to consider your favorite pressing issue or concern), youth violence involves dynamic relationships that change over time. Just as it is challenging to herd cats, it can be challenging to get a dynamic system to perform as desired. Underneath the dynamics, you see multiple players, driven by diverse interests. It's difficult to gauge the relative strength of the interdependencies that drive behavior or the unintended consequences that can get set into motion as result of an initiative. And it can be hugely difficult to communicate understanding in simple ways that regular folk can understand. Tools and frameworks that were designed to address simpler problems may not be up to the task of tackling a systems problem.

Key Characteristics of a Systems Problem

1. Dynamics—change over time
2. Multiple Players, diverse interests
3. Driven by interdependencies
4. Very difficult to communicate

That's where *system dynamics*, the approach that we have used in this Project, can add value. System dynamics has evolved over the past 50 years, and is currently being applied to a broad swath of issues in the private and the public sector. As outlined in the next section, it provides an approach for building understanding around systems problems, and for testing initiatives aimed at improving performance. Because system dynamics relies on a simple, graphical language, it's accessible to wide range of individuals. Because sophisticated math is going on under the surface, a system dynamics model can bring some of the tools of the hard sciences to messy social problems.

A Model Can Support a Community-Based Process

While it's possible to do system dynamics analyses in the back room or the ivory tower, for our project, the real value of building and working with a model is that it has become a focal point for engaging a broad set of community perspectives in the process of thinking rigorously about a pressing social issue. The resultant learning and insight is something that stays with the community.

Because the objective of this project is fundamentally about empowering the community to understand community-based violence and to strategize ways to achieve sustained reductions in violence, we felt that the modeling approach could provide significant value-added. The modeling effort became an instrument for engaging the community in productive dialogue. In developing the model, for example, we relied heavily on the youth insight into gang involvement. Central to this process was a set of design team meetings, in which adults and youths with first-hand knowledge shaped the development of the model. The discussions that shaped model development worked to build community and to forge a common understanding among participants. Subsequent work has provided multiple opportunities for teams of individuals to interact with the model, but perhaps more important, to interact with one another in focused, thoughtful conversations about experiments, outputs, and the relation of the model to their world. Through this process,

the model has helped to focus, capture, and advance community thinking around youth violence.

A Really Brief Introduction to Systems

In order to understand the inner workings of the YVSP Strategy Lab, it's important to have just a bit of an understanding of the key concepts associated with the system dynamics modeling approach from which the model was developed. Here, we'll provide a quick overview. Books (heavy books!) have been written on the subject, so if you want to dig deeper, a quick on-line search will speed you on your way.

Systems Concept 1: Structure drives behavior

Doug Hall of EGC likes to talk about the differences between a cat and a toaster. One important difference is that while a cat is structured to do cat-like things, a toaster is structured to make toast. This insight is the heart of the idea that structure drives behavior. The implication of this concept is simple: If you understand how a process or system is put together, you'll be in a better position to design interventions aimed at improving the performance of the system.

Systems Concept 2: Stocks and flows

Stocks and flows provide a mechanism for representing the essential structure of a system. Stocks, represented by a rectangle, are accumulations. You can think of them as buckets that hold various forms of stuff—people, things, money, etc. Flows, represented by directed pipes, represent the actions or activities that cause stocks to fill or drain over time. The simple examples below illustrate the dynamics that emerge from a simple stock and flow structure. A more complex structure, such as the “slippery slope” that emerged from discussions with community members, is capable of underwriting extremely sophisticated dynamics.

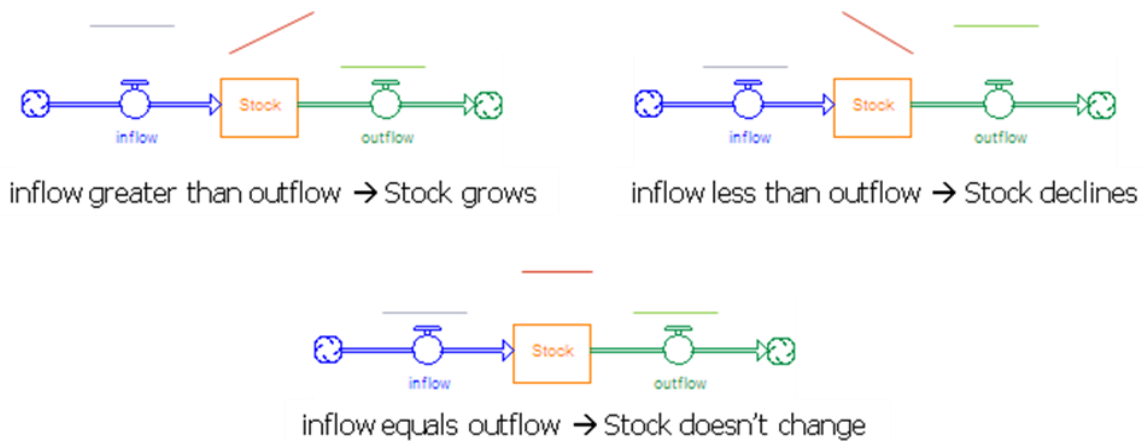


Figure 1. Simple Examples of Structure-Behavior Pairings

Systems Concept 3: Nonlinearities

Many familiar systems are linear in the sense that output is proportional to input. For example, if it takes you five minutes to walk a certain distance, you're likely to walk twice that distance in ten minutes. In contrast, more complex systems often are nonlinear in nature. A change in one part of the system can lead to disproportionately large (or small) changes elsewhere in the system. As you'll see, the YVSP Strategy Lab incorporates several important nonlinearities that emerge from the underlying structure of high-violence communities.

Systems Concept 4: Feedback

Feedback is at the source of many system nonlinearities. If you've ever seen your favorite sports team go on a "run," you've seen the effect of feedback. Your team scores. Their confidence grows. They find it easier to score again. Confidence grows even more! More formally, feedback exists when the current state of the system along one or more dimensions motivates actions, which in turn change the state of the system as you move forward in time. This is illustrated with the simple feedback loop diagram in Figure 2.



Figure 2. A simple feedback loop

Feedback processes underwrite many real-world dynamics of growth, decline, and equilibrium seeking. In the YVSP Strategy Lab, feedback is at the heart of two critical processes that can cause a community to get "stuck" in high-violence cycles.

Systems Concept 5: Don't seek to prove truth; seek to falsify

Falsification has a long history in the philosophy of science. This approach to building understanding involves the development of a provisional explanation for why something is happening, and then testing that explanation to discover the circumstances under which it doesn't hold together. The learning cycle continues as new insights are incorporated into an improved explanation. Our work on the YVSP Strategy Lab has given us multiple opportunities to test our thinking in this manner. In particular, our interaction with engaged communities of interest (especially the adults and youth members of Design Teams) provided us with opportunities to gain "ground truth" insight into high-violence communities. This insight from team members then was used to improve the inner workings of the simulator.

How the YVSP Strategy Lab Works

In the creation of the YVSP Strategy Lab, we have worked very hard to develop a highly physical, value-neutral representation of the relationships that drive violence among youth. The model is physical, in the sense that it uses stocks and flows to account for changes in the composition of a community's youth population over time. It is value-neutral, in the sense that it provides a framework for exploring policy initiatives from a

wide range of sociopolitical perspectives. The model is driven by the interaction of five key components, as illustrated to the right.

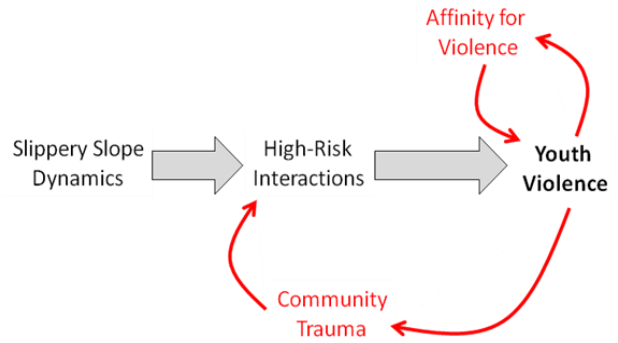


Figure 3. An Overview of the YVSP Strategy Lab

In the model, slippery slope dynamics among youth provide the context in which high-potential-for-violence interactions occur. As suggested by the name, high-risk interactions are those interactions among individuals and groups within the community, that have the potential to result in violent activity. Violence, in turn, can cause the buildup of symptoms of trauma within the community, which in turn increases the likelihood of high-risk interactions among youth. Finally, among those engaged in violence, violent acts can drive the buildup of an affinity for violence as the default mode of interaction, further driving violent activity over time.

Let’s take a closer look at these key components of the YVSP Strategy Lab.

Slippery Slope Dynamics

The slippery slope map (shown below) was developed over multiple Design Team meetings. It continues to be refined as we engage with communities of interest. The “buckets” in the map categorize youth along the spectrum from “Uninvolved” to “Gang Shooter/Leader.” The flows, indicated by directed arrows, represent pathways by which youth can move over time between the different buckets. Overall, the slippery slope enables us to capture the potential for youth within a defined community to drift over time toward gang involvement.

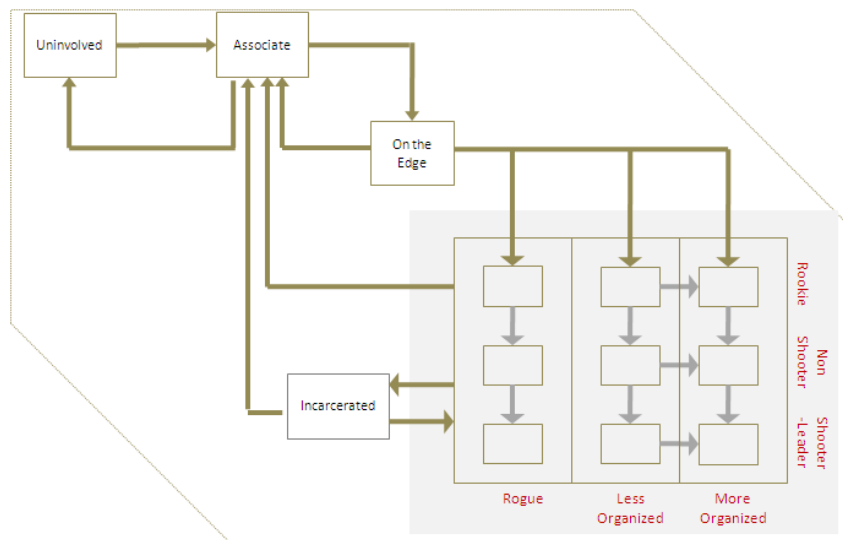


Figure 4. The "Slippery Slope"

As a fundamental organizing framework for the YVSP Strategy Lab, the slippery slope map serves the overall project in several important ways. First, it provides one vehicle for understanding differences between communities—higher violence communities are more likely to have higher concentrations of gang members than lower violence communities. Second, the map has enabled us to elicit deep insights from community members. Initially, for example, we began with a very simple representation of gang members: a single bucket. By discussing this simpler structure with community members, we learned about the differences between Rogues (isolated individuals), Less Organized Gangs, and More Organized Gangs (often organized more or less as a small business). Similarly, we learned about the development path for gang members (Rookie to Non Shooter to Shooter/Leader) through discussions around a simpler structure. Third, the map provides a way for individuals, agencies, and other interested parties to identify the targets for various initiatives. A summer youth jobs program, for example, might be targeted at moving youth back from “On the Edge” status. Finally, because the slippery slope map enables us to characterize the rate of movement of youth as well as the distribution of youth among the various buckets at any point in time, it provides a basis for understanding the physical source of high-potential-for-violence interactions between various members of the community.

“I learned to look at things from a different perspective and to look at the bigger picture.”

—Participant in Aug. 2010 project meeting

High-Risk Interactions

Within the structure of the YVSP Strategy Lab, the slippery slope map serves another essential function: it creates the context in which high-risk interactions occur. A network of potential connections between individuals and groups exists within any community. Over time, interactions occur along the lines of connection. The further down the slippery slope, the riskier these interactions are in their potential for underwriting violent activity. What’s perhaps more important is the nonlinearity involved: as the distribution of youth in a community moves down along the slippery slope, the network of high-potential-for violence connections that underwrite high-risk interactions becomes disproportionately larger.

The figure below illustrates this phenomenon. In the left panel, there is a single less-organized gang. The right panel adds a second less-organized gang to the mix. Note the dramatic difference in the density of connections within the network—particularly the red connections that suggest a higher likelihood for violence.

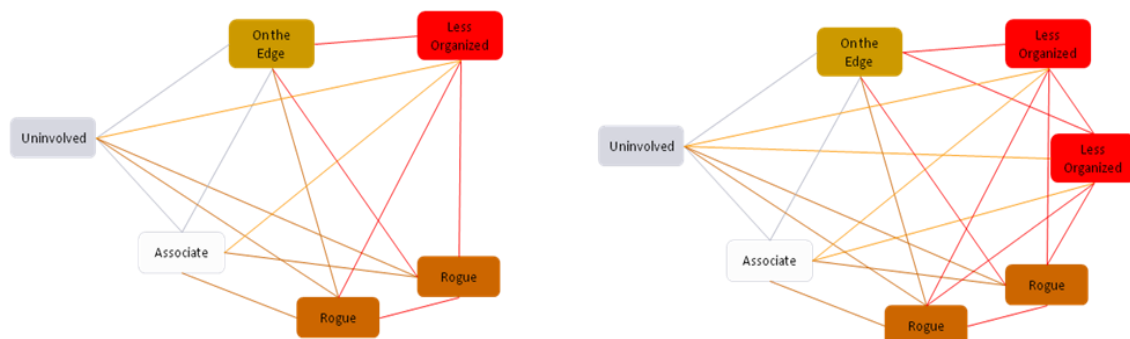


Figure 5. Illustrative High-risk Interaction Networks

In the YVSP Strategy Lab, we capture this network structure relatively simply. We begin by dividing each bucket of youth along the slippery slope into sub-groups called nodes. Connections exist between each node in the resultant network. The further down the slippery slope, the greater the flux over time of high-risk interactions along a connection. As an example, a connection between a rogue and a less-organized gang crew results in a higher number of high-risk interactions each year than a connection between two groups of uninvolved individuals.

Community Trauma

Relatively early on in the project, we learned that many high-violence communities tend to exhibit behaviors that look a lot like the symptoms of post-traumatic stress disorder (PTSD). In particular, these communities tend to exhibit high levels of arousal (for example, hyper-vigilance). One implication of violence-induced community trauma is that sub-groups that comprise the community can misread social cues, transforming a benign interaction into one with potential for violence.

A simple feedback loop, shown at right, captures the reinforcing dynamic associated with community trauma. As the loop shows, other things equal, higher levels of community trauma lead to higher fluxes of high-risk interactions within the community, which in turn result in increased levels of community violence. To complete the thought, increased violence tends to drive community trauma even higher.



Figure 6. Feedback Around Community Trauma

Affinity for Violence

It's been said that "if your only tool is a hammer, everything begins to look like a nail." This insight applies to many areas of life, and has particular applicability to this project. A simple feedback loop captures the dynamic.

The concept depicted here is straightforward: violence begets violence. More precisely, the loop says that the more one engages in violence, the more violence becomes the "default" operating mode for interacting with others. This, in turn, further fuels the cycle for those who take part in violent activity.

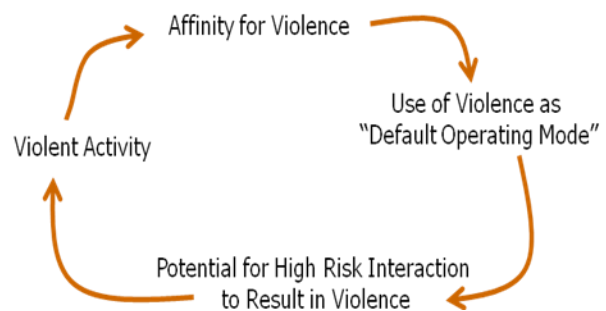


Figure 7. Affinity for Violence

Tying it all together: Youth-Generated Violence

Slippery slope dynamics, high-potential-for-violence interactions, community trauma, and affinity for violence all come together in the generation of youth violence. The model

captures both gun-related violence and other violent activity among youth (think assault and battery). Because the YVSP Strategy Lab approaches drivers of youth violence from a highly physical, value-neutral perspective, it can facilitate individual and group investigation of initiatives aimed at changing the rates of movement of individuals along the slippery slope, as well as initiatives aimed at changing the nature of social interaction within the community.

Interacting with the YVSP Strategy Lab

The YVSP Strategy Lab does not tell you how to best implement a policy, program, or initiative in the real system. It does, however, provide us with an experimental laboratory

“This was good. We can talk about things better through this.”

—Participant in Aug. 2010 project meeting

in which we can explore the implications of initiatives aimed at different parts of the system. By exploring this “policy space,” it’s possible to begin to identify potential high-leverage intervention points in the system. There are two primary points of interaction with the simulator: The “Configure Experiments” screen and the “Run Experiments” screen.

Configure Experiments

The “Configure Experiments” screen, shown in Figure 8, is the first primary point of interaction with the simulator. It’s a bit of a mixed metaphor, combining the slippery slope map with a set of switches taken from the set of the movie *Young Frankenstein*. Users can activate initiatives in isolation or in combination by pulling the switches.

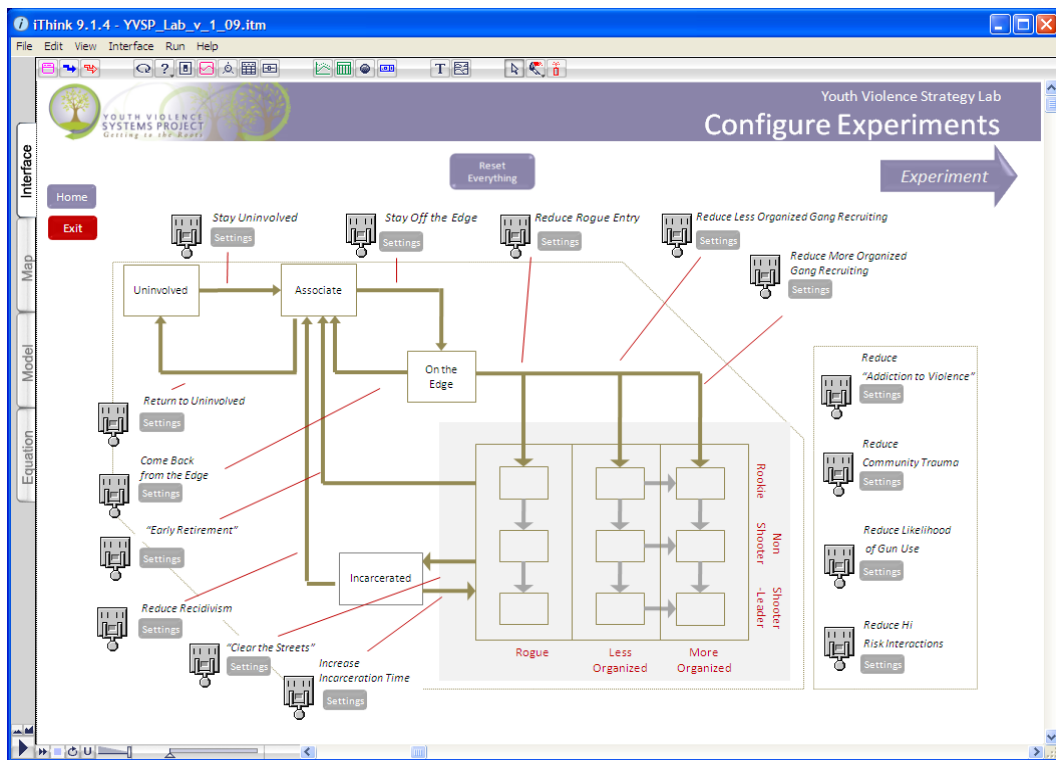


Figure 8. YVSP Strategy Lab Configure Experiments Screen

A click on the “Settings” button associated with each switch brings forth a new screen containing explanatory text and additional configuration options. Shown below, for example, is the settings screen associated with the “Stay Off the Edge” initiative.

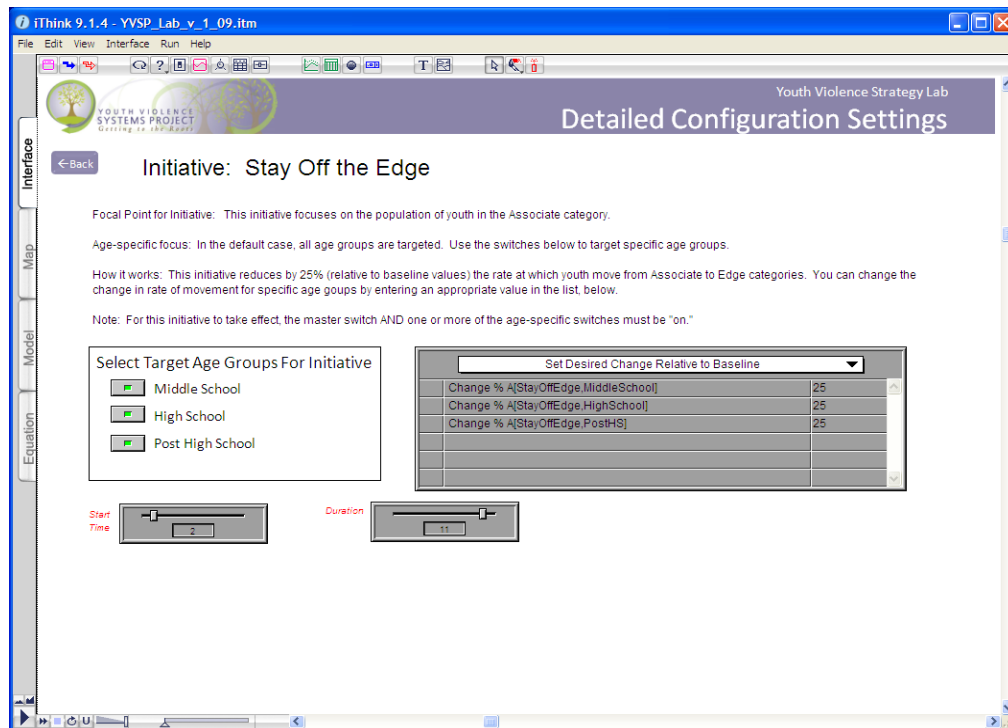


Figure 9. Detailed Experiment Settings

We encourage people to work in small groups to configure experiments. The discussions that result tend to be both focused and productive. We encourage people to think through the effect over time of a set of initiatives by sketching out the response of key community indicators (such as gun violence, gang involvement, etc.). We also encourage people to discuss in detail how a particular initiative might be implemented in their community.

Run Experiments

Once an experimental setup has been configured, it's time to run a simulation experiment. Results are shown in graphs of behavior over time, as flashing warning lights, and as numbers. The model is set up such that if none of the levers are pulled, it generates relatively stable behavior over the twelve-year simulation horizon. On the other hand, when an initiative set “hits” the system, the graphs will show a response. Model output thus provides another touchpoint for focused group discussion.

“I am now able to see, understand and explain where my organization fits in with other initiatives and organizations to reduce youth violence.”

— Participant in Aug. 2010 project meeting

For example, on the next page is shown the result of an initiative that aims to stem the movement toward gang involvement, by focusing on preventing youth from moving from the “Associated” to “Edge” categories, and by accelerating the movement back from the

edge to “Associated”. The results suggest that this targeted initiative has potential for underwriting a significant reduction in violence among youth. Summer job or internship programs, by providing a meaningful alternative to “hanging around on the street” might be one mechanism for preventing the slide to the edge, or for returning from the edge of gang involvement.



Figure 10. Sample Output

Communities, Uses, and Potential Outcomes

Over the past several months, a wide range of stakeholders have interacted with the model, both in formal and informal settings. It is important to note that we have constructed the model for the communities that we are serving—it’s a tool that we think can improve understanding of youth violence in Boston and has potential to help communities in Boston to strategize and achieve sustained reductions in violence. That being said, it’s clear to us that there is potential value-added that can accrue to a wide range of stakeholder groups. The table on the next page provides our perspective on communities of interest, uses, and potential outcomes.

	Community	Agency	Policymaker	Academic Community	Funders	Gang Members
Uses	<ul style="list-style-type: none"> Evaluate interventions proposed by others Evaluate interventions proposed by the community 	<ul style="list-style-type: none"> Evaluate agency interventions Evaluate policies Communicate program effectiveness 	<ul style="list-style-type: none"> Evaluate historic policy impact Anticipate future policy impact Design systemic policies 	<ul style="list-style-type: none"> Evaluate historic intervention outcomes and impact Analyze impact of potential interventions Design systemic policies 	<ul style="list-style-type: none"> Evaluate impact of past interventions Evaluate interventions proposed by agencies or policymakers 	<ul style="list-style-type: none"> Evaluate how changes in their behavior impact the system
Potential Outcomes	<ul style="list-style-type: none"> Better informed community Improved community interventions Common language for discussing interventions 	<ul style="list-style-type: none"> Better agency interventions Improved agency communication 	<ul style="list-style-type: none"> Improved policy choices Improved system-wide intervention strategies 	<ul style="list-style-type: none"> Improved analysis Improved system-wide intervention strategies 	<ul style="list-style-type: none"> Better informed about where to invest funding effectively Improved community interventions 	<ul style="list-style-type: none"> Improved engagement of gang members in intervention development

A Few Process Take-aways

As we began working on the YVSP Strategy Lab, we had great confidence, based on work in government and industry, that the effort to develop and roll out a dynamic model could help us to meet the Project’s twin objectives of improving the understanding of community-based violence in Boston, and of helping communities to strategize and achieve sustained reductions in violence. And yet...we approached the effort with more than a tiny bit of trepidation. Would systems thinking be too ivory-tower-academic for the communities involved? Would people engage with the simulator? Would the technical aspects of the simulator overwhelm users? Happily, these fears have largely been unfounded. In fact, we’ve discovered some important aspects about the intersection of system dynamics and community engagement around a critical social concern:

- Community members take to the systems approach that underlies the simulator. Systems thinking “feels real” to them.
- Youth in particular “get” the logic of systems. They understand systems insights, and are able to analyze the model without difficulty.
- Within the community, there seems to be strong intuition for interdependencies— but perhaps not a language for making sense of how interdependencies come together to produce undesirable results such as youth violence. Community members seem to understand that “everything is connected to everything else,” but they don’t necessarily have the tools to take action on that understanding.

- This stuff (stocks and flows, nonlinearities, feedback, and the strategy laboratory concept) provides a working language for sense-making, advocacy, and empowerment .

What's Next

Dynamic simulation models such as the YVSP Strategy Lab tend to evolve in fits and starts over time to meet the evolving needs of stakeholder groups. The version of the model illustrated here has been stable for several months, but important changes are in process. While the first version of the model focused on the *city* of Boston, a second version will focus on a more narrowly-defined set of *communities* within Boston. This more narrow focus will enable us to better understand the dynamics of specific neighborhoods, and may help to support the development of community-specific interventions.

In addition, there is potential in the coming months to broaden the base of users of the model. For example, projects outside of Boston have expressed keen interest in learning more about the model and about the process used here. In a similar fashion, faculty from a range of different disciplines have expressed an interest in using the model as part of their curriculum. Because we have designed the model to provide a framework for improving the understanding of community-based violence, we believe that the simulator may be able to support the efforts of these emerging communities of users.

The YVSP Strategy Lab is a powerful tool, but it's important to remember that it is only a tool. Used skillfully as a device for inquiry within the context of a community-centric process, the tool has potential to engage and empower community members as they strategize initiatives to achieve sustained reduction in violence. On the other hand, the tool has potential to cause damage when used as a polemic device to "prove" pre-conceived notions! Accordingly, we are making haste (but slowly) as we consider next steps for the model. We will take measured steps as we broaden the base of users. And we'll continue to rely on the community-based process that has brought the model to where it is now.