

A Comparative Study Using Propensity Score Matching to Predict Incarceration Likelihoods Among SSYI and non-SSYI Youth from 2011-2013

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Executive Summary

Background

A team led by the American Institutes of Research (AIR) and WestEd was commissioned by the Massachusetts Executive Office of Health and Human Services (EOHHS) to conduct a series of studies to evaluate the Safe and Successful Youth Initiative (SSYI). To address serious youth violence, particularly that involving guns, Massachusetts launched SSYI in 2011, providing a comprehensive public health approach to addressing young men, between the ages of 14-24, believed to be at “proven risk” for being involved in firearms. Young men deemed as “proven risk” are those with one or more of the following characteristics: committed a violent crime using a gun or knife, victimized by violent crime and prone to retaliation, or being a known gang member. Eleven cities with the highest violent offenses reported to the police in 2010 were selected for SSYI funding beginning in 2011 and then started implementing the program. This report presents findings from a comparative analysis of incarceration status of SSYI and non-SSYI youth living in nine of the eleven SSYI cities, from 2011 to 2013: Boston, Brockton, Chelsea, Fall River, Holyoke, New Bedford, Lowell, Springfield, and Worcester.

Research Questions

Our three research questions are structured to test the hypothesis that SSYI involvement results in less serious offending, the result of which should appear as fewer commitments to jail or prison in the two-year period after the program began in 2011.¹ The research questions that will test the hypothesis are:

1. Does placement on the SSYI list, regardless of services received, serve as a protective factor against future incarceration?
2. Does receipt of SSYI services serve as a protective factor against future incarceration?
3. Does active engagement in SSYI services serve as a protective factor against future incarceration?

Methodology

The initial step of the study required SSYI police partners to generate information from their data systems for youth with one or more of the proven risk characteristics from the period of January 1, 2011

¹ This can theoretically include commitments to youth or adult facilities, but since the majority of the sample is currently over the age of 17, we are interpreting this as commitments to adult facilities.

through December 31, 2013. Since SSYI was funded in 2011, this two-year period includes the initial period when youth were identified for the program and 2 years after the initial funding date.² The goal was to identify a comparison group with whom SSYI youth could be matched, to produce a rigorous means to analyze the effectiveness of SSYI outcomes, short of conducting an outcome evaluation of each of the program sites. SSYI's police partners were asked to report their crime data for all male youth, between the ages of 14 and 24 (SSYI inclusion criteria), who had one or more of the proven risk characteristics, because these youth would be eligible for treatment through SSYI and who would make for a valid comparison group. It should be noted, that all, or the vast majority of, SSYI youth should be represented in the police data report created from this process. Once the police identified this universe of young men for the sample, additional police and program-level data were collected on the youth's degree of criminal activity (number and type of offenses across all three years), current incarceration status, enrollment status in SSYI (original list or a later list), service engagement with SSYI, risk and protective factors for engaging in criminal activity, and basic demographic information. Program staff stripped all identifying information about youth and then entered the pertinent crime and study data into a secure, online research database called REDCap. REDCap is managed through a research consortium at Vanderbilt University, of which AIR is a partner organization.

Results

1. **Youth who were on the SSYI list, but did not receive any services, were twice as likely to be incarcerated** as youth in the comparison group who were not on the SSYI list, but who shared the same risk characteristics.
2. **Youth in the comparison group were 37% more likely to be incarcerated** than SSYI youth who received services.
3. **Youth in the comparison group were 42% more likely to be incarcerated** than youth who were actively engaged in SSYI services.

Conclusion

In this study, receiving SSYI services and engagement with those services had a strong, positive effect on reducing the likelihood that a young person will be incarcerated. This was true even when accounting for past criminal history to determine incarceration likelihood. The results of the current study

² Not all sites received their funding or implemented the program at the same time, but all sites were selected to begin the program in 2011.

are consistent with the community-level results from the recent SSYI Interrupted Time Series study that showed an overall decrease in victimization due to violence in the SSYI cities as compared with cities without SSYI during the same time period as the years covered in this study (Petrosino, Turner, Hanson, Fronius, & Campie, 2014).

It's theoretically possible that lower incarceration likelihoods could be the result of simply being on the SSYI list, if police and courts are more lenient with SSYI youth who come to their attention. However, when we analyzed status on the list itself as a factor predicting incarceration, we saw no such protective effect and in fact SSYI youth were more likely to be incarcerated when on the SSYI list, but not receiving any services through the program. Thus receiving and engaging in services would appear to be the reason driving the lower incarceration likelihood as compared with similar proven risk youth in the community.

The results from this study are very encouraging and warrant that an outcome evaluation be done to examine each SSYI program may be leading to individual changes in youth involved in the program. The current study looked at *aggregate* likelihood of incarceration among SSYI youth *across nine SSYI sites* as compared to similar peers in these cities, but an outcome evaluation would look at *individual outcomes within each site* and connect these to program implementation so we can determine what aspects of the intervention are leading to success. In order to take this next step, issues of local data quality and consistency in program implementation, and even eligibility criteria, may need to be addressed. For example, through the process of conducting the study, the research team had to exclude 29% of the data submitted by sites because of data quality issues. This suggests the need to invest in data and reporting infrastructure so the program sites and their police partners can access reliable information when they need it. This will allow them to make good decisions about enrollment and service provision with the dollars they have, as well as provide accurate reporting on outcomes to EOHHS and the Commonwealth.

Through the course of working with the nine SSYI sites in this study the research team learned that there is a great deal of variation in the way that sites use police data to create and update their lists, and that program eligibility is determined locally, rather than following the general guidelines set forth by EOHHS (e.g. 14-24 years, gang-affiliated as a proven risk characteristic). It was also true that some sites have a fairly static list that is unchanging and other sites have a more fluid list, adding and removing youth over time. Since sites use a collaborative process to select youth for the list, since resources prohibit all youth from being served, there could be missed opportunities to reach the most disconnected (and potentially most at-risk) young men. However, there may be good sense to the way that sites are making these decisions and rather than forcing one approach too fast, it may be helpful to convene the sites and have a facilitated discussion on the eligibility criteria and list management question. The meeting should also be grounded in

the context of what we know about effective programs from the Rapid Evidence Assessment that the research team conducted in 2013, as well as what we have learned in this study and from the recent SSYI Interrupted Time Series report. Given the results of the current study, and the potential cost-savings of fewer incarcerations and life savings of fewer victims, this type of investment in ensuring the program can maintain and enhance its effectiveness would be money well spent.

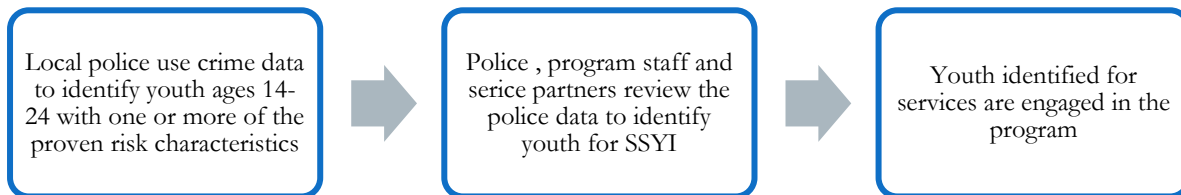
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Background

To address serious youth violence, particularly that involving guns, Massachusetts launched the SSYI in 2011, providing a comprehensive public health approach to addressing young men, between the ages of 14–24, believed to be at “proven risk” for firearms violence. Youth who are deemed as “proven risk” are those with one or more of the following characteristics: committed a violent crime using a gun or knife, victimized by violent crime and likely to retaliate, or a known gang member. Eleven cities with the highest violent offenses reported to the police in 2010 were selected for SSYI funding in 2011. Although there are variations across sites, there are some components that are mandatory and must be included in each SSYI program at the city level:

- Specific identification of young men, 14–24, who are considered to be at proven risk based on a review of local police data (Exhibit 1);
- Use of street outreach workers to engage these young men; and
- A comprehensive case management approach to assess current needs, link youth with needed services and supports, and monitor and reinforce positive progress.

Exhibit 1. SSYI List Creation Process



EOHHS commissioned a team led by the American Institutes of Research (AIR) and WestEd to conduct a series of studies to understand SSYI’s effectiveness. One of the first studies AIR and WestEd completed was a Rapid Evidence Assessment to review the state of the research literature with regard to effective urban violence prevention programs targeting high-risk older youth, ages 14–24. In the 2013 report, *What Works to Prevent Urban Violence Among Proven Risk Young Men? The Safe and Successful Youth Initiative Evidence and Implementation Review*, we provided a summary of best practices and strategies in violence prevention that can inform the use of program components implemented by SSYI sites and provide a policy

yardstick by which to measure current SSYI practices against other approaches.³ Our research review indicated that programs similar to SSYI, which use a targeted list to identify high-impact youth offenders, coupled with street outreach workers and case management that connects youth with needed services, showed promise in reducing violent crime in the cities implementing the interventions (Campie, et al. 2013)⁴.

In follow-up to this work, the research team completed an analysis of community crime outcomes between 2009 and 2013 among SSYI cities compared to two different groups of comparison cities: (1) the 25 cities next in ranking in reported violent crimes in 2010; (2) a smaller subset of 6 cities that did not receive Shannon or SSYI funding. Using an Interrupted Time Series (ITS) design, the study utilized victimization data from the National Incident Reporting System (NIBRS) and local police data from Boston and Lawrence (which did not report to NIBRS during the time period under study). The findings from this analysis indicated a positive and statistically significant impact of SSYI on reducing victimizations in SSYI cities. On average, the study showed a reduction of 60 violent crime victims between the ages of 14-24 each year, per 100,000 persons. As of 2010, the population in these 11 SSYI cities combined was 1,501,343, so a reduction of about 5.5 victims per month per 100,000 people amounts to approximately 900 fewer victims, ages 14-24, in the 11 SSYI communities per year. This represents 1,800 fewer victims of violent crime, ages 14-24, during SSYI's two year implementation period from 2011 to 2013. (Petrosino, Turner, Hanson, Fronius, & Campie, 2014).

As a next step, the research team was asked to complete a comparative analysis of outcomes for SSYI youth versus community youth who exhibit the same proven risk characteristics. Nine SSYI communities were included in this analysis: Boston, Brockton, Chelsea, Fall River, Holyoke, New Bedford, Lowell, Springfield, and Worcester. For this study, the research team used crime data from local police and program data from SSYI sites to implement a rigorous statistical matching technique to compare incarceration likelihoods between youth in the SSYI program and similar youth not in the program.

Research Questions

The study's three research questions are structured to test the hypothesis that SSYI involvement results in less serious offending, the result of which should appear as fewer commitments to jail or prison in

³ This report is available through EOHHS or on the AIR website at: <http://www.air.org/resource/what-works-prevent-urban-violence-among-proven-risk-young-men>

⁴ These cities are Indianapolis, Philadelphia, and Cincinnati. It should be noted that no state in the U.S. other than Massachusetts currently implements a multi-city urban gun violence intervention program such as SSYI.

the two-year period after the program began in 2011. We predict that the protective effect of SSYI should increase as youth move from initial contact with the program, through receipt of services, to full engagement in the program. The research questions are:

1. Does placement on the SSYI list, regardless of services received, serve as a protective factor against future incarceration?
2. Does receipt of SSYI services, regardless of engagement level, serve as a protective factor against future incarceration?
3. Does level of engagement in SSYI services serve as a protective factor against future incarceration?

Methods

Sample Selection

Nine of the eleven sites and their police partners provided data to the research team using an online secure data system called REDCap (Research Electronic Data Capture), for which AIR has a license through Vanderbilt University.⁵ REDCap is a secure, web-based application designed to support data capture for research studies, providing 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources (Harris, et al. 2009). This system was accessed by site staff and their partners to enter data on SSYI youth and youth in the comparison group. All data were stripped of personal identifiers by program staff and the research team never had access to data that showed youth names, dates of birth, or other personally identifiable information. Each site was trained on REDCap by AIR staff, who also provided ongoing technical support to the sites throughout the data entry process. Sites were able to generate a report from REDCap of the data they entered, so they would have a record of their work for internal performance monitoring purposes. The data were collected and entered into REDCap over a span of three weeks. Site staff reported spending an average of 50 hours of time collecting and entering data for the study, with some sites needing close to 80 hours to complete their tasks.

As enumerated earlier, there are multiple characteristics of proven-risk youth, which is the target population for SSYI. These characteristics were used by each police department to query their data system and identify the sample of youth for the study. The police looked for youth with one or more of these

⁵ At the request of EOHHS, Lawrence and Lynn did not participate in the study citing inadequate capacity to complete the data tasks in the available timeline.

characteristics from January 1, 2011 through December 31, 2013.⁶ Since SSYI was funded in 2011, this two-year period includes the initial period when youth were identified for the program as well as later periods when additional youth were added to the program lists. The goal was to identify all male youth with one or more of these characteristics, between the ages of 14 and 24 (SSYI inclusion criteria), during this time period. It should be noted, that all, or the vast majority of, SSYI youth should also be in the police data report created from this process, if sites are following the proven risk inclusion criteria established by EOHHS. This process provided the means to select a comparison group of those male youth who were not part of SSYI, even though they possessed the characteristics that would make them otherwise eligible for the program. Once the police identified this universe of young men for the sample they provided sites with their offending histories and then program staff recorded the youth's degree of criminal activity (# and type of offenses across all three years), current incarceration status, enrollment status in SSYI (original list or a later list), service engagement with SSYI, risk and protective factors, and basic demographic information. A full list of the study variables is shown in the Appendix-Exhibit 3.

Data Procedures

All data entered by the nine SSYI sites were integrated into one data file, with an identifier retained to distinguish sites from one another. After this step, the data were analyzed to identify any incomplete records, any discrepancies in data within one record (e.g., receiving SSYI services but not being on the SSYI list), and unusual reporting patterns.⁷ Sites were contacted with questions about particular issues related to their records and once all issues were addressed, the dataset was finalized for analysis. The final sample consisted of 2,198 youth.

The first analysis consisted of descriptive statistics to understand the basic dimensions of the dataset, including the total number of cases (youth), the number and nature of offenses committed, how many youth were in the SSYI program, what SSYI services were offered, the level of engagement in SSYI services, and

⁶ Definitions for these characteristics as used in this study:

Gun crime: Any crime involving a gun that is not a shooting

Knife crime: Any crime involving a knife that is not a shooting

Use of a dangerous object: Any violent crime where the weapon was not a gun or knife

Shooting: Discharging a firearm and targeting a victim

Stabbing: Stabbing that is done by a knife or other object

Victimized by violence: Specific to being shot or stabbed

Gang-affiliated: Known to police as associated with a gang

⁷ A breakdown of the reasons why cases were deleted after this step, and the number of cases deleted, is shown in the Appendix.

demographics such as age, race, ethnicity, and sexual orientation.⁸ This was followed by Chi Square analyses that compared two different variables to each other, such as offending behaviors and being on the SSYI original or current list (Lindquist, 1953).⁹ This analysis allowed us to see which independent variables, such as engagement in services, were most strongly associated with the dependent (outcome) variable, current incarceration. Logistic regression analyses then tested the statistical significance of the relationships between independent variables, such as prior offending and SSYI involvement, with current incarceration status being the dependent, or outcome, variable (Draper & Smith, 1981; Menard, 2002).

Before conducting the regression analyses, we created a propensity score for each youth in the comparison group and SSYI (treatment) group and matched these youth based on their scores for the purpose of creating a valid comparison for the analyses. A propensity score is a statistical process that estimates the likelihood that any one youth in our sample would have the same risk likelihood and as a result be eligible to be in the same treatment group as youth who receive SSYI services (Rosenbaum & Rubin, 1985). The community youth who have this propensity, based on their proven risk characteristics, were statistically matched with SSYI youth who also have this propensity. In essence, these two groups are then assumed to be almost identical in terms of their propensity to engage in behaviors for which SSYI is designed to affect, namely violent offending. The difference between the groups is their involvement in the SSYI program, which enables us to see whether SSYI youth fare better on offending outcomes than youth in the comparison group. By using propensity scores, we reduce the possibility that the observed findings were due to SSYI youth being a different population than non-SSYI youth. The technical methods we used to create the propensity scores between the SSYI group and the comparison group are described in the Appendix- Exhibit 5.

Results

The sample used for analysis contained 2,198 youth who had one or more of the proven risk characteristics for the SSYI program. Exhibit 2 summarizes features of the sample. The most common aspect across both SSYI youth and comparison youth was gang membership (1,319 youth). The least common characteristic was committing a stabbing (149 youth). Most of the youth in the sample are

⁸ Sexual orientation was collected to determine whether victimization status was correlated with being in a sexual orientation minority group.

⁹ For purpose of analysis we asked sites to distinguish between youth identified for the original SSYI list in 2011 and youth added to the list at a later date.

currently between ages 21 and 24, which for SSYI youth means they entered the program no younger than age 17 or 18. Race and ethnicity were not routinely collected or reported by police, and as a result most of these data were not available. In those instances in which race and ethnicity were known, the sample was approximately split between Black (697) and White (634) youth. Finally, almost half of the youth whose ethnicity was known (46%) were reported to be of Hispanic/Latino origin.

Exhibit 2. Sample Characteristics (N = 2,198)¹⁰

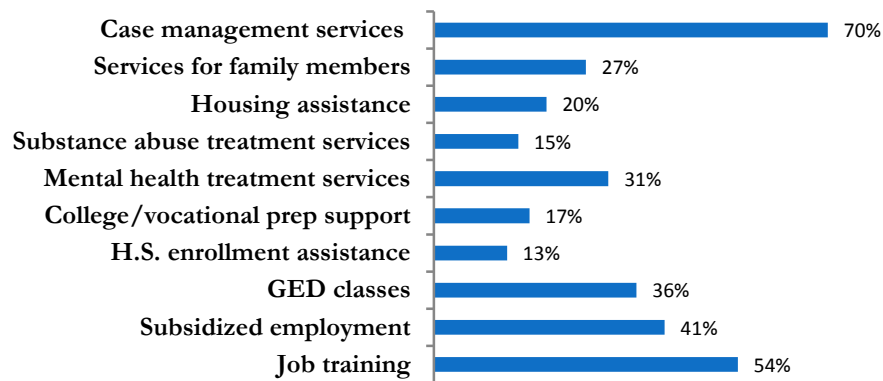
Proven Risk Characteristics			
	All Youth	SSYI Youth	Non-SSYI Youth
Gun Crime	738	49%	51%
Knife Crime	417	29%	71%
Violent Act with Dangerous Object	237	59%	41%
Shooting	208	48%	52%
Stabbing	149	39%	61%
Gang Member	1,319	56%	44%
Shooting/Stabbing Victim	571	26%	74%
Age ¹¹			
	All Youth	SSYI Youth	Non-SSYI Youth
14-17	142	23%	77%
18-20	595	36%	64%
21-24	1129	43%	57%
Race			
	All Youth	SSYI Youth	Non-SSYI Youth
Black	697	61%	39%
White	634	30%	70%
Asian	71	73%	27%
Native American	1	0	1
<i>Data Not Available</i>	794	22%	78%
Ethnicity			
	All Youth	SSYI Youth	Non-SSYI Youth
Hispanic/Latino	712	36%	64%
Non-Hispanic/Latino	841	60%	40%
<i>Data Not Available</i>	641	11%	89%

¹⁰ The proven risk category is greater than 2,198 where multiple options could apply to one youth. One record was not completed for the race question and four records were not completed by program staff for the ethnicity question, resulting in sample sizes of 2,197 and 2,194 respectively on those items.

¹¹ 332 youth are currently age 25 or older.

Although the focus of this report is on the difference between SSYI youth and non-SSYI youth who have similar risk propensities, the research team also conducted analyses of services received by SSYI youth as well as risk and protective factors for these youth, as judged by program staff. These data provide context for interpreting the results in this report. SSYI targets the highest risk young men in regard to serious violence perpetration and victimization – many who do not want to be contacted. In this sample, 70.3% of youth identified as on the current list or original list (created in 2011) have received some type of service between 2011 and 2013. The majority of these youth (70%) received case management services and job training (54%), and about a third (31%) received mental health treatment (Exhibit 3). Nineteen percent (19%) of SSYI youth also received services from the Shannon program.

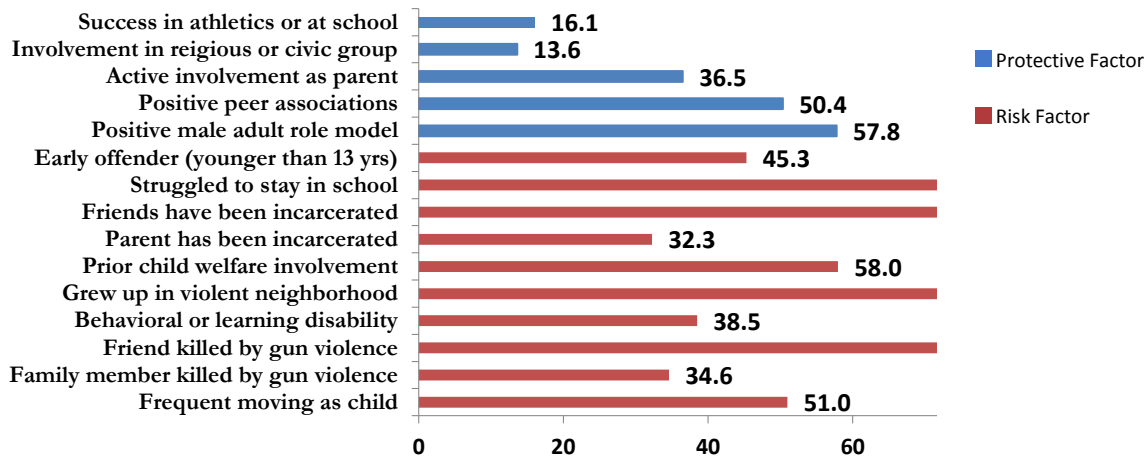
Exhibit 3. SSYI Services Received



Since one of our research questions looks at engagement as a protective factor against future incarceration, we also conducted analyses to determine which youth characteristics are most strongly associated with engagement in the program. Previously being a victim of gun or knife violence, as well as receiving services through the Shannon violence prevention program were each associated with engagement in SSYI. Exhibit 4 in the Appendix details all of the results of the engagement analysis.

SSYI serves a group of young persons with many of the risk factors associated with violence (Exhibit 4) For example, nearly half (45.3%) of these young persons committed some type of offense before age 13 and eight of every 10 participants struggled to stay in school or have dropped out altogether (82.4%). Moreover, peer, family, and community risk factors suggest a propensity towards violence, such as family (35%) or friends (77%) killed by guns, or growing up in a violent neighborhood (97%). More than half of the SSYI youth experienced prior involvement with the child welfare system as children (58%).

Exhibit 4. Risk and Protective Characteristics of SSYI Youth (%)¹²



Research Question 1: Does placement on the SSYI list, regardless of services received, serve as a protective factor against future incarceration?

Being on the SSYI list, but not receiving services, produced a statistically significant *twofold increase* in the probability that youth will be incarcerated (Exhibit 5).

Exhibit 5. Logistic regression of SSYI List Status on incarceration likelihood

Jail	Coefficient (C)	Standard Error	z	Odds Ratio
On SSYI List	.7768138**	.3172985	2.45	2.175
Constant	-1.890464	.3051585	-6.20	

Number of Observations: 828 Wald chi2 (1): 5.99 Prob >chi2: 0.0144 Log Psuedolikelihood: -431.3022
 *p<.05; **p<.01; p<.001 (two-tailed test)

¹² There are a large number of cases with unavailable data associated with risk and protective factors. The largest data gaps are within the Family, Peer, and Community risk factors. These gaps range from 31.4% missing for “grew up in violent neighborhood” to 56.5% missing “success at athletics or in school”.

Research Question 2: Does receipt of SSYI services, regardless of engagement level, serve as a protective factor against future incarceration?

Youth who did not receive SSYI services experienced a **37% increase in the odds of incarceration** (Exhibit 6). In this case, because the odds ratio is less than 1 (0.61) it is conventional to interpret the result as (1/the odds ratio) for its effect on the comparison group, rather than a 63% decrease in incarceration odds for the treatment group (SSYI youth) (Davies, Crombie, & Tavakoli, 1998).

Exhibit 6. Logistic regression of SSYI service receipt on incarceration likelihood

Jail	Coefficient (C)	Standard Error	z	Odds Ratio
SSYI –received services	-.494626**	.175274	-2.82	0.61
Constant	-.8345099	.141062	-5.92	

Number of Observations: 829 Wald chi2 (1): 7.96 Prob >chi2: 0.0048 Log Psuedolikelihood: -354.70535
 *p<.05; **p<.01; p<.001 (two-tailed test)

Because it is likely that other factors, such as criminal history, would have a strong impact on future incarceration, we added these variables to our regression model and found that while SSYI’s impact is weakened, it is still highly significant in reducing the likelihood of incarceration (Exhibit 1-Appendix).

Research Question 3: Does level of engagement in SSYI services serve as a protective factor against future incarceration?

We measured level of engagement for any youth receiving SSYI services (Exhibit 7). Youth judged by staff as not engaged in SSYI services experienced a **42% increase in the odds of being incarcerated**. In this case, because the odds ratio is less than 1 (0.63) it is conventional to interpret the result as (1/the odds ratio) for its effect on the comparison group, rather than a 58% decrease in incarceration odds for the treatment group (SSYI youth).

Exhibit 7. Logistic regression of SSYI engagement on incarceration likelihood

Jail	Coefficient (C)	Standard Error	z	Odds Ratio
SSYI - engaged in services	-.4605326**	.1794199	-2.57	0.63
Constant	-.0607236	.3168788	-0.19	

Number of Observations: 829 Wald chi2 (1): 6.59 Prob >chi2: 0.0103 Log Psuedolikelihood: -358.00645
 *p<.05; **p<.01; p<.001 (two-tailed test)

When adding criminal history to the regression model, youth engagement in SSYI remained highly significant predicting reduced likelihood of being incarcerated (Exhibit 2-Appendix).

Discussion

In this study, the receipt of SSYI services had a strong, positive effect on reducing the likelihood that a young person will be incarcerated. This was true even when using SSYI service receipt as the sole variable predicting incarceration status, or when adding the criminal offending history of the youth into the equation; meaning that criminal history is not overtaking the strength of SSYI service receipt to determine incarceration likelihood. Those engaged in SSYI services experienced an even stronger protective factor against incarceration, which was hypothesized to be true given the theory that greater engagement might mean youth are consistently following their service plan to achieve positive youth development goals. We do not know how police suppression activities in the SSYI cities may be impacting arrest or incarceration patterns overall, but we do know from the ITS study that overall crime was decreasing in the SSYI cities more significantly than in cities without SSYI during the same time period as the years covered in this study. For those youth on the SSYI list but receiving no services, their likelihood of incarceration increased substantially in contrast with the comparison group. If SSYI is unable to reach or engage the highest risk youth, our results suggest these youth will continue offending and are more likely to be incarcerated than other high risk youth in the community.

Limitations

This study was conducted in a very short timeframe, with less than 45 days to collect, enter, analyze and report on the data. Had the timeline been longer the sites would have had more time to collect and enter specific offenses by date for each youth so that a repeated offending and time to re-offense analysis could be done in relation to SSYI involvement. As it was, each site reported spending from 20 to 80 hours of time on this study, utilizing help from a variety of people who were working overtime to get the study done. Additional time would have also allowed the research team to work with the Lynn and Lawrence sites, which did not have the capacity to accommodate the quick turnaround of the data request, and would have allowed Boston to go back and enter their data on community youth with proven risk characteristics¹³.

¹³ Boston only provided information on SSYI youth.

Despite the time limitations, the nine SSYI sites did a remarkable job providing complete and accurate data to answer the research questions.

A second limitation is the unevenness of data across different police departments and SSYI program sites. Some sites had easy access to police data that included all the proven risk characteristics and could be analyzed by gender, age and year using automated software; other sites had to pour over records by hand and then piece together the information they needed. This was true of the program sites also, with some having databases of youth service involvement and risk/profile characteristics and others that do not have this capability, making detailed and systematic reporting difficult. The differential manner in which sites are implementing SSYI also presented challenges for the study because not every site is using the proven risk criteria or age range to determine who should be in their program. Because of this, several sites said that their youth would not “show up” in the police data because they had not been arrested, but the program personnel know the young person is at risk for violent behavior. Still other sites are not serving youth younger than 18 years old, and many sites did not think gang membership or affiliation was reason enough to be SSYI eligible.

Lastly, this study does not include data on policing practices that could impact the way crimes are detected, or court and prosecution patterns that could influence charging and incarceration decisions. Since the study city (sites) is shared in common between both SSYI youth and youth in the comparison group we assume there is equal probability of being apprehended, charged and incarcerated for offenses by youth in either group, so this potential limitation should be negated in that case.

Implications for Practice and Research

1. Conduct an outcome evaluation of all SSYI sites. The results from this study are very encouraging and warrant that a rigorous outcome evaluation be done to look at how each SSYI program is leading to individual level changes in youth involved in the program. The current study looked at *aggregate* behaviors of SSYI youth *statewide* as compared to similar peers across the state, but an outcome evaluation would look at *individual outcomes within each site* and connect these to program implementation so we can determine what aspects of the intervention are leading to success and what might be less important or even detrimental. The study also showed that many youth meeting the high-risk criteria are not being served. To address the impact of this on community safety, a randomized controlled experiment could be used to create a pool of all youth meeting SSYI criteria and randomize so some receive SSYI services and some do not. This study

could also measure what intervention services the non-SSYI youth get outside of SSYI (e.g., Shannon funded services) and look at policing practices to see how suppression efforts are impacting overall changes in violent offending. Should the program be expanded or moved to different cities in Massachusetts in the future, or even replicated in other states, the results of a rigorous outcome evaluation would be key to informing those decisions before costly investments are made.

2. Implement a data reporting system to improve police and program-level data on youth. The research team previously conducted an analysis for EOHHS in January 2014 where we outlined a number of data quality and infrastructure recommendations that can improve the accuracy of reporting from SSYI sites. Because of the fragile funding environment at the time, it was not possible to invest in this data infrastructure need. To ensure timely and accurate data that can support an outcome evaluation and provide information back to the state for accountability purposes, an investment should be made to create a data infrastructure that sites can use. The system used by sites in this research study (RedCap) is one option to consider. It is a free system that is supported through a secure and internationally-respected research consortium. It can provide a case management-style database structure that would fit well with the design of the SSYI sites. The research team has previously provided a tour of this system and its capabilities to EOHHS and now that the sites have used the system for this study, it may warrant further exploration for future reporting needs.

3. Revisit program eligibility requirements and list management strategies. Through the course of working with the nine SSYI sites on this study the research team learned that there is a great deal of variation in the way that sites use police data to create and update their lists, and that program eligibility is determined locally as shown in Exhibit 1 earlier in the report. It was also true that some sites have a fairly static list that is unchanging and other sites have a more fluid list, adding and removing youth over time.¹⁴ Since sites use a collaborative process working with police to choose which youth to serve, as resources are finite, there could be missed opportunities to reach the most disconnected (and potentially most at-risk) young men. As our results show, youth on the list who are not receiving services are likely to continue offending to such a degree that they eventually become incarcerated. However, rather than mandating one eligibility/list management approach too quickly, it may be helpful to convene the sites and have a facilitated

¹⁴ To illustrate this point, in the Appendix we include a chart showing the discrepancies between the number of youth on the original list (2011), the current list (2014) and the numbers reported in each site's quarterly reports from 2012-2014.

discussion on the eligibility criteria and list management question. The meeting should also include a review of what we know about effective programs from the Rapid Evidence Assessment report as well as what we have learned in this study and from the ITS report, so local wisdom is grounded in the context of the best evidence on what works to prevent urban gun violence.

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Appendix

Exhibit A-1. Logistic regression of service receipt on incarceration likelihood – full explanatory model

Jail	Coefficient (C)	Standard Error	z	Odds Ratio
Age	.0413992	.0352238	1.18	1.042
White	-.0962946	.3145092	-0.31	0.908
Asian	-.1050401	.4622609	-0.23	0.900
Hispanic	.0291527	.3313425	0.09	1.030
Gun Crime	.9182013***	.1931467	4.75	2.505
Knife Crime	.918615***	.2358285	3.90	2.506
SSYI Received Services	-.458323*	.209492	-2.19	0.632
Constant	-2.346547	.7889272	-2.97	

Number of Observations: 829 Wald chi2 (1): 58.5 Prob >chi2: 0.0000 Log Pseudolikelihood: -336.11109

*p<.05; **p<.01; p<.001 (two-tailed test)

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Exhibit A-2. Logistic regression of service engagement on incarceration likelihood – full explanatory model

Jail	Coefficient (C)	Robust Standard Error	z	Odds Ratio
Age	.0508561	.0354268	1.44	1.052
White	-.0607236	.3168788	-0.19	0.941
Asian	-.078579	.4602728	-0.17	0.924
Hispanic	-.0456672	.3754726	-0.14	0.955
Gun Crime	.9102133***	.192221	4.74	2.485
Knife Crime	.9287848***	.2370185	3.92	2.531
SSYI Engaged in Svcs.	-.4163441*	.2143203	-1.94	0.659
Constant	-2.576946	.7933016	-3.25	

Number of Observations: 829 Wald chi2 (1): 58.5 Prob >chi2: 0.0000 Log Pseudolikelihood: -336.11109

*p<.05; **p<.01; p<.001 (two-tailed test)

Exhibit A-3. Study Variables

Variable	Definition
SSYI List	Is the youth on the site's current or original SSYI or on no SSYI list
Receipt of Shannon Program Services	Is the youth known to have received services through the site's Shannon Program grant
Receipt of SSYI Services	Did the youth receive SSYI services from the site between 2011 and 2013
Type of SSYI Services Received	The specific services received through the SSYI site, between 2011 and 2013, including: <ol style="list-style-type: none"> 1. Job training 2. Subsidized employment 3. G.E.D. prep classes 4. High school re-enrollment assistance 5. College or vocational prep support 6. Mental health treatment 7. Substance abuse treatment 8. Housing assistance 9. Services for family member(s) 10. Case management
Level of SSYI Engagement	Between 2011 and 2013, youth's level of involvement in SSYI services: <ol style="list-style-type: none"> 1. Never offered services 2. Offered services but never engaged in them 3. Engaged in services on and off 4. Engaged in services regularly 5. Engaged in the program beyond receiving services (e.g., acted as a volunteer or mentor to other young people)
Proven Risk Characteristics (for selecting the sample)	Between 2011 and 2013, did the youth: <ol style="list-style-type: none"> 1. Commit any crime using a gun 2. Commit any crime using a knife 3. Commit any violent act with a dangerous object other than a gun or knife 4. Commit a shooting 5. Commit a stabbing
Gang Involvement	Between 2011 and 2013, was the youth a known gang member
Criminal/delinquent Victimization	Between 2011 and 2013, was the youth a victim of a shooting or stabbing
Frequency of Criminal/delinquent Offending	Between 2011 and 2013, with how many of these offenses was the youth involved (0–5 or more): <ol style="list-style-type: none"> 1. Administrative violations of a court order 2. Petty or disruptive nonviolent incidents 3. Nonviolent property incidents 4. Nonviolent drug or alcohol incidents 5. Violent incidents of any kind
Incarceration Status	Is the youth currently in jail or prison

Risk and Protective Factors	Which of the following is true for the youth: <ol style="list-style-type: none"> 1. Has moved from place to place growing up 2. Has had a family member killed by gun violence 3. Has had a friend killed by gun violence 4. Has a behavioral or learning disability 5. Has grown up in neighborhoods with high levels of violent crime 6. Has previous child welfare involvement 7. Has a parent who has been incarcerated 8. Has friends who have been incarcerated 9. Has struggled to stay in school 10. Began offending at an early age (younger than 13) 11. Has a healthy male adult role model to look up to 12. Has friends who have gotten their lives together 13. Is a parent actively involved in with his child 14. Is connected with a local religious or civic group 																								
Age	Youth's current age (14–Older than 26)																								
Deceased	Is the youth deceased																								
Race	Youth's race: <ol style="list-style-type: none"> 1. Black 2. White 3. Asian 4. Native American 5. Pacific Islander 																								
Hispanic/Latino	Is the youth Hispanic or Latino																								
Ethnicity	Youth's ethnicity: <table style="width: 100%; border: none;"> <tr> <td>African</td> <td>Dominican</td> <td>Korean</td> </tr> <tr> <td>Brazilian</td> <td>European</td> <td>Laotian</td> </tr> <tr> <td>Cambodian</td> <td>Filipino</td> <td>Mexican</td> </tr> <tr> <td>Cape Verdean</td> <td>Guatemalan</td> <td>Middle Eastern</td> </tr> <tr> <td>Caribbean</td> <td>Haitian</td> <td>Puerto Rican</td> </tr> <tr> <td>Chinese</td> <td>Honduran</td> <td>Salvadoran</td> </tr> <tr> <td>Colombian</td> <td>Japanese</td> <td>Vietnamese</td> </tr> <tr> <td>Cuban</td> <td></td> <td></td> </tr> </table>	African	Dominican	Korean	Brazilian	European	Laotian	Cambodian	Filipino	Mexican	Cape Verdean	Guatemalan	Middle Eastern	Caribbean	Haitian	Puerto Rican	Chinese	Honduran	Salvadoran	Colombian	Japanese	Vietnamese	Cuban		
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Cuban																									
Sexual Orientation Minority Status	Is the youth gay, bisexual, or questioning?																								

Exhibit A-4. Description of the study sample by engagement in the SSYI program

	N Total Sample¹⁵	% SSYI	N SSYI	% engaged in SSYI services
	2198	38	843	70
Received Shannon services				
Yes	73	97***	71	75
No	858	35	297	72
Proven Risk				
Gun crime- yes	736	49***	358	71
- no	1401	33	461	71
Knife crime- yes	417	29***	121	81*
- no	1661	41	683	71
Other object - yes	237	59***	139	84***
- no	1583	39	612	68
Shooting- yes	208	48	99	65
- no	1668	42	703	73
Stabbing - yes	149	39	58	84*
- no	1715	43	744	71
Shoot/stab victim - yes	568	25***	144	83
- no	1328	41	550	78
Known gang member- yes	1316	56***	737	71
- no	645	15	97	68
Offending				
Admin violations - yes	168	93***	157	83***
- no	672	72	487	62
Petty incidents - yes	431	62	269	80***
- no	655	62	408	60
Property incidents - yes	307	69**	211	78***
- no	784	60	471	62
Drug/alcohol incidents - yes	299	78***	234	82***
- no	793	57	449	60
Violent incidents - yes	1057	40***	421	70*
- no	465	60	278	62
At least one of the above	598	74*	440	68*
None of the above	205	82	168	59
Currently incarcerated				
Yes	190	93**	176	66***
No	638	84	536	82

~p<0.1 *p<0.05 **p<0.01 ***p<0.001

¹⁵ Does not take missing data into account ,which means these percents add up to 100% and may be different from percents reported elsewhere in the report *IF* those account for missing/data unavailable responses.

Exhibit A-5. Propensity Score Matching Methodology

To account for any factors that might be associated with the likelihood of being selected for inclusion in the SSYI program, we estimated three propensity score models to measure individual's probabilities of selection and participation in the SSYI program (i.e., being on the list, receiving services, and being engaged in the SSYI program). All three propensity score models included variables for whether or not they had committed a gun crime between 2011-2013. To estimate the probability of receiving an SSYI service or of engagement in SSYI services, an indicator for whether or not they had committed a knife crime in the same timeframe was also included in the propensity score model. The mean propensity scores for treatment and control groups are presented below:

- On the SSYI list: 0.41
- Not on the list: 0.37
- Received a service: 0.28
- Did not receive a service: 0.27
- Engaged in SSYI services: 0.29
- Was not engaged in SSYI services: 0.26

These weights were applied to regression analyses where treatment status predicts incarceration, controlling for age, race, gun crime perpetration and knife crime perpetration.

$$W = S / (1-S) \text{ if treatment} = 0$$

Exhibit A-6. Breakdown of Records Excluded from the Data Set Prior to Analysis

Reason for exclusion	Number of cases excluded
No Site ID	1
No SSYI Status Selected	1
No Proven Risk Characteristic Selected	774
Deceased	26 (all from Boston)
No Service Engagement Response Selected	1
Selected SSYI Engagement but not on SSYI List	6
Selected SSYI Service Receipt but not on SSYI List	27
Selected SSYI List but never offered services	63
Selected Engagement but did not receive services	10
Total Cases Excluded	903
	(29% of all records entered – 3,093)