



MEMO

TO: Adult Redeploy Illinois
FR: SPAC
RE: County Use of Prison in ARI Counties
Date: March 2, 2020

Adult Redeploy Illinois (ARI) is a performance-incentive funding program that awards grants to county governments to reduce admissions to state prisons. ARI, created in 2009 as part of the Illinois Crime Reduction Act (Pub. Act 96-0761), requires a county to reduce prison admissions by 25% from the prior three years. Instead of prison, people receive an alternate sentence that typically involves probation with additional treatment and/or supervision requirements. Each county designs its own program, centered on national evidence-based practices and analysis of local data, then submits the proposal for state funding.

The Sentencing Policy Advisory Council (SPAC) chairs ARI's Performance Measurement Committee that reviews metrics on progress towards statutory goals. SPAC created quasi-experimental statistical models to assess the ARI impact and progress. The models test whether a reduction in either the prison admissions rate and/or the probability of an eligible conviction receiving a prison sentence occurs after counties join ARI. The models use different methodology and data to ensure the results are not a fluke of one approach or data source: SPAC uses the Criminal History Records Information (CHRI) system, a statewide dataset with convictions and sentences, and the Illinois Department of Corrections (IDOC) admissions records.

Model One shows that ARI counties reduced prison usage overall by having fewer Class 3 and 4 non-violent prison admissions than non-ARI counties. Model Two shows a decrease in the probability of prison sentences after implementing ARI. Both results are statistically significant. The average reduction, while difficult to measure precisely, is estimated to be 14 prison admissions per 100,000 people. For example, this estimated impact would be a reduction of 21 prison admissions per year for a county with a population of 150,000 adults.¹

The consistency between models establishes confidence that the results are due to ARI and not external factors, although overall results mask significant variation between sites. Further, data issues and model design may overstate—or understate—ARI as a cause of the reduction, when other unknown factors are either confounding or driving the reduction. **However, the overall results are positive and indicate that ARI is working as intended.**

¹ Estimated by using the estimate of impact (14 prison admission reduction per 100,000) times a 150,000 population, assuming they implement an ARI program with an average effectiveness. Both Champaign and Sangamon counties are about 150,000 adults, meaning that if a county of this size implemented an average ARI program, the prison admissions would reduce by 21 people per year.

Q: Does ARI funding reduce prison admissions, holding all else equal?

A: Yes. ARI counties on average had fewer Class 3 and Class 4 non-violent prison admissions than non-ARI counties. The consistency between models establishes confidence that the results are due to ARI and not external factors, although the overall results mask significant variation between ARI sites.

Q: Does ARI funding reduce the probability of receiving a prison sentence, holding all else equal?

A: Yes. After ARI funding began, the likelihood of receiving a prison sentence for Class 3 and 4 non-violent felonies decreased compared to similarly situated people before the program began.

Q: How big is the impact of ARI?

A: The average reduction, while difficult to measure precisely, may vary between a small impact and something as large as 14 prison admissions per 100,000 people. For a county with a population of 150,000 adults, the impact could be as large as a reduction of 21 prison admissions per year.

Q: Why is the ARI impact not bigger?

A(1): Sites can be more limited in setting a reduction goal by selecting a smaller targeted population based on how well their program suits the potential clients' needs. Each county designs and operates its own program after funding is approved by the ARI Oversight Board. Sites start with state estimates of non-violent, Class 3 and 4 prison admissions to establish preliminary target populations and reduction goals but counties may limit eligibility. Some counties include additional offenses, but others narrow eligibility and the impact may be smaller. Further, local design-and-control approach means no single treatment occurs everywhere.

A(2): Other factors are larger drivers of criminal justice offenses, arrests, charging decisions, plea bargaining decisions, and sentencing than a counties' participation in ARI. These other factors may mask, strengthen, or weaken the true impact of ARI in some counties. Because of these issues, SPAC reports the average ARI impact effect across counties that answers the broadest questions but does not assess any individual county performance.

Q: Does this study account for the eligibility expansion that occurred in Pub. Act 100-999, effective January 1, 2019?

A: No. The analysis includes data through 2018. Also note that jurisdictions applied for and began operation at varying points from the program's creation in 2010 through 2018. The various starting dates enhance the assessment of an ARI-effect as the statewide crime trends differed over the period of time before (control) and after (treatment) the site began enrolling clients.

This memorandum first summarizes the methodology and data SPAC used to conduct this analysis. Next, the memo explains the two models—generalized synthetic control and multilevel logistic regression—the results, and a short conclusion. The explanations are somewhat technical but provide the detail of why the results are reliable and allow readers to assess the validity of the conclusions. Finally, the memo describes the data limitations and suggestions for future research.

Data & Methodology

To answer the question of whether ARI reduces prison admissions, the models assess whether counties (*i.e.*, ARI sites) change their use of prison after joining ARI. Clients/participants in ARI are not randomly selected, so a pure randomized control trial was not possible.² Instead, SPAC uses quasi-experimental methods to determine if ARI affects prison admissions.

One challenge for the analysis is that overall admissions to prison are decreasing, not just for counties that operate an ARI program, making the identification of any effect from ARI difficult. Furthermore, SPAC does not know which convictions in the data are ARI diversions. This analysis aims to isolate any effect on prison use by using two different models: one using aggregate-level data and one using individual, conviction-level data.³ The two models each answer slightly different questions and use different assumptions, increasing confidence in the overall findings.

A second challenge is that sites may set smaller target populations from within the larger, statutory eligible population, but they might not adhere strictly to these targets. For this analysis, the generic population of interest chosen was Class 3 and 4 non-violent offenders. This population was chosen because that group accounts for approximately 75% of eligible prison admissions.⁴

An ideal method would be a difference-in-difference (DID) design to answer the question of whether ARI sites had reduced prison admissions versus comparable, non-ARI sites. However, DID models assume that ARI and non-ARI sites have parallel trends prior to the treatment intervention—*i.e.*, other than treatment, the trends and issues in ARI counties are substantially similar to those in non-ARI counties. In reality, the assumption is violated if elections, decision-maker changes, and community factors vary across counties, all of which are true. Further, SPAC's preliminary analysis of the data shows non-parallel trends in the data between ARI sites and non-ARI jurisdictions, indicating a violation of this assumption.

The solution is Model One: creating a synthetic control from comparison counties so that a synthetic comparison is created where weights are applied to other counties such that the outcome

² Counties are also not randomly selected. ARI has recruited counties' participation by focusing on the highest prison-admitting jurisdictions as well as select applicant counties through a competitive grant process.

³ Two additional models were tried as well: A Generalized Synthetic Control model using the proportion of CHRI convictions receiving a prison sentence model and a standard difference-in-difference model. The results were consistent and added confidence in the findings stated in this memorandum. However, missing data issues made the GSC model with CHRI data less preferable compared to use of prison admission rates. The standard difference-in-difference models indicated a reduction that was not significantly different from zero, but this model is not preferred due to violation of the parallel trends assumption.

⁴ If a county only sentences a small number of Class 3 and 4 non-violent offenders to prison per year, any reduction from ARI would likely be indistinguishable from expected annual variation. To remedy this, SPAC checked if the three-year average number of Class 3 and 4 non-violent admissions for each county were at least twenty per year for each year from 2001 through 2018. If at least ten of these years met these criteria, the data were kept at the county level. If not, the data were aggregated to the judicial circuit. For example, if a circuit had one county with on average 50 admissions and four counties with on average 3-19 admissions, the first county is kept as is and the remaining are aggregated together. Therefore, the unit of analysis is a geography-year combination.

Note: Cook County is excluded entirely. Although Cook County receives ARI funding and has operated one or two programs annually, the number of clients served by these programs is relatively small compared to Cook's overall convictions and prison admissions. Most importantly, there are no adequate comparison counties in Illinois.

measures parallel the ARI counties' trends, satisfying the DID assumption. Using this Generalized Synthetic Control (GSC) method,⁵ SPAC fits a synthetic control for each treatment site, at each starting point for that site, and then averages the effects across sites. In other words, first the model creates comparisons between ARI sites and composites of comparable counties such that the parallel trends assumption is met and then the treatment effect for all sites is averaged across the whole state. The result is an Average Treatment effect on the Treated (ATT) for each year of the intervention.⁶ The GSC modeled Class 3 and 4 non-violent admission rates per 100,000 people age 18 or older using IDOC admissions data and population data.⁷

Model Two, a multilevel logistic regression, answers the question of whether the probability of a prison sentence changes after ARI begins in a county. For the multilevel logistic model, SPAC uses CHRI data for arrest, conviction, demographics, and prior convictions in ARI counties. Other control data used are felony filings, arrests, convictions, probation sentences, and unemployment, all normalized by the population age 18 or older or the labor force.

Model One using prison admission rates is our primary model as it involves the least amount of measurement error and missing data. This approach finds that ARI funding reduces prison admissions. Model Two finds that ARI reduces the likelihood of receiving a prison sentence for those convicted of a Class 3 or 4 nonviolent felony. These results are consistent when using different models and datasets, adding a robustness check to the results.

For this analysis, the start date for ARI participation begins with the first enrollment. In practice, ARI begins with the county applying for the grant, then a planning period with state funding to design the program, then the county applies and may receive full implementation funding, and only then does the site begin with a first enrollment. These dates occur throughout each year and over the period analyzed. For the purposes of these analyses, sites counted as part of the ARI program based on the date of the first enrollment. If the first enrollment occurred in the first six months of the year, that year and all future years were ARI-active years. If the first enrollment was in July or later, the next year and all future years are ARI-active years. Given the geography and ARI-active decisions, Figure 1 shows ARI participation for geographies in Illinois over time (calendar years).⁸

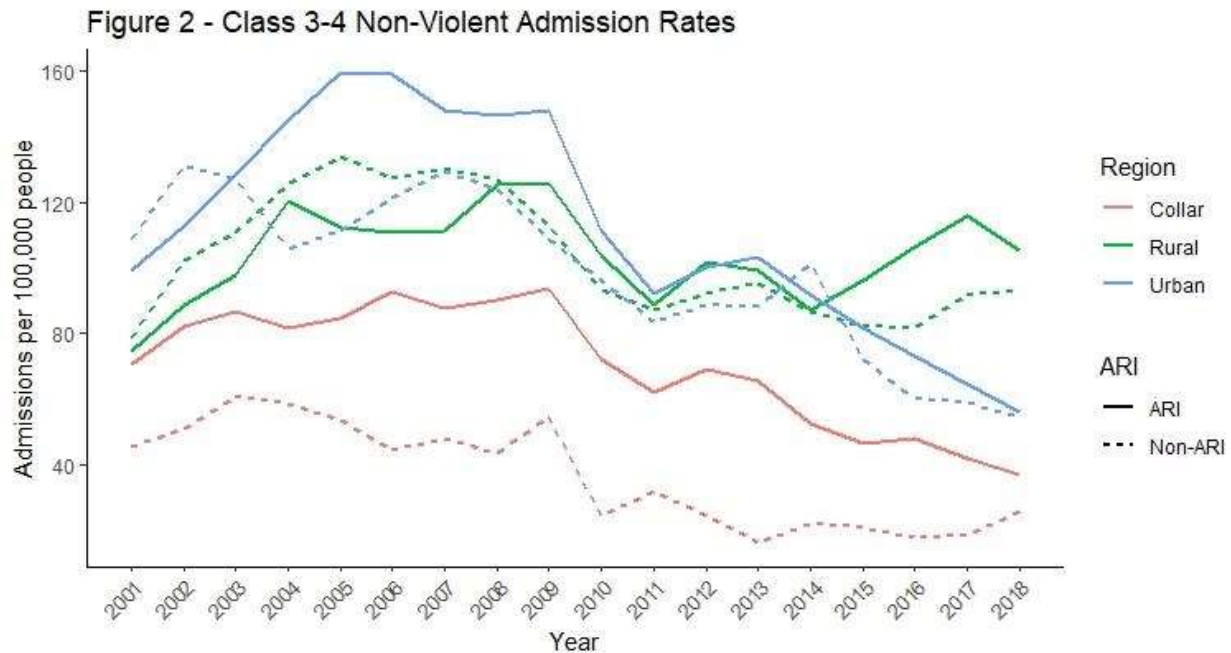
⁵ See Xu, Y. (2017). Generalized Synthetic Control Method: Causal Inference with Interactive Fixed Effects Models. *Political Analysis*, 25(1), 57-76.

⁶ Technically, GSC uses an interactive, fixed-effects model that also estimates latent factors that represent trends not explicitly modeled but that are shared among the observations. Latent factors are essentially trends that occur within the regressions' residual terms. This technique is a significant improvement over other approaches and their assumptions, however there is no guarantee that the balanced counterfactual is fully parallel to the treatment sites. For more explanation, see Bai, Jushan (2009). Panel Data Models with Interactive Fixed Effects. *Econometrica* 77:1229-1279.

⁷ A GSC model using the proportion of Class 3 and 4 convictions with prison sentences from the Criminal History Records Information (CHRI) system confirmed the results appear in different datasets. This approach requires CHRI sentencing data, which does have missing data that are not random, particularly in the early to mid-2000's. The systemic gaps could bias the estimates and/or make them inefficient; thus, this second approach is used just as a robustness check.

⁸ Some sites suspended enrollments or left during a budget impasse, but this nuance is not modeled here.

100,000 people and 85 per 100,000 people after. The decline is not uniform across the state: some counties had little to no change and others increased their admissions. ARI focused recruitment on the largest prison-admitting counties and Figure 2 shows that ARI counties generally had higher prison admission rates for Class 3 and 4 non-violent offenses than non-ARI counties.⁹



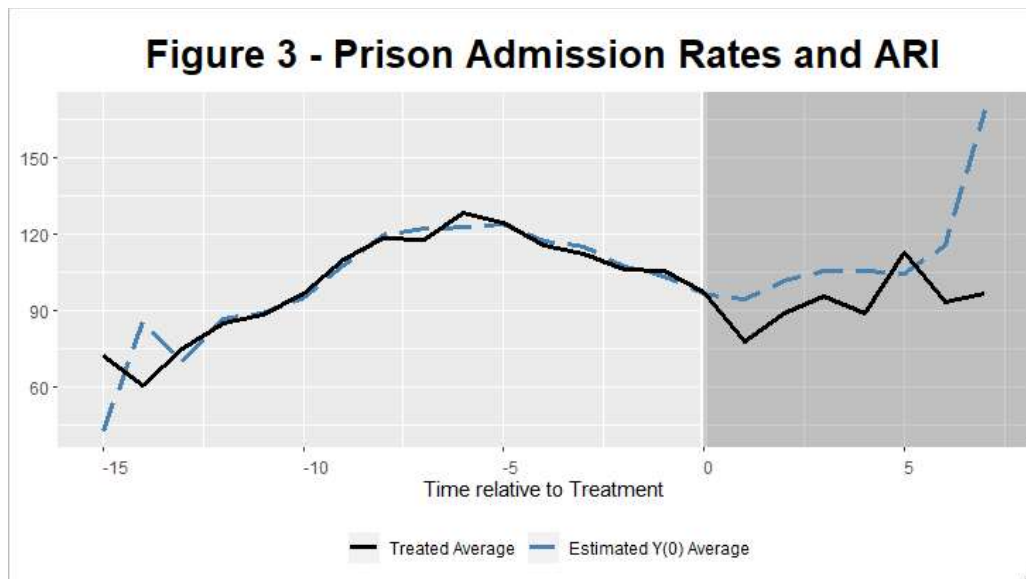
Model One: Generalized Synthetic Control (GSC) Results

GSC creates a synthetic comparison county for each ARI site and then averages the treatment effect across all sites. Two GSC models were fit to the data to ensure the results are robust. First, SPAC uses Class 3 and 4 non-violent prison admission rates as the outcome, originally with no additional covariates and then adjusting for unemployment, arrest, conviction, and probation sentence rates. The GSC with no covariates shows a significant overall average treatment effect reducing the admission rate by 16 admissions per 100,000 people.

Adding covariates to the model – a preferred model – shows a similarly sized impact: reducing 14 admissions per 100,000 people when holding all else equal. **The GSC model finds that, controlling for other factors, ARI counties see a reduction in the prison admission rate.** The standard error suggests this rate change is statistically significant with a 95% confidence interval between 1 and 27 admissions per 100,000 people.

⁹ Additionally, Figure 2 shows that the parallel trend assumption is likely violated. A visual inspection shows that generally, the difference between the ARI and non-ARI trendlines after 2011 is reducing except in rural counties. The GSC model identifies these two latent trends in the data even after controlling for year and county fixed effects.

Figure 3 shows the simulated Average Treatment effect on the Treated (ATT) for prison admission rates using the first model. Table 1 below shows the complete results.



The treatment effect varies depending on when sites began. For those sites that have existed for at least five years, the fifth year has the smallest reduction. This result may reflect the impact from the budget impasse but the fifth year does not align with the budget impasse for all counties. The sites that started in 2011 show the largest impact of a reduction of almost 70 admissions per 100,000 people. However, that large reduction is primarily due to a sharp decline in admissions in a few counties, particularly Macon County.

Table 1 on the following page shows the median estimated treatment effect on the prison admissions rate. In the GSC model, the year is relative to the geography’s ARI start date and is not uniform across sites. For example, -1 represents 2010 for a site that began in 2011 and represents 2015 for a site that began in 2016. Table 1 also shows the number of ARI geographies operating ARI in that relative year. Years 7 and 8 are a small portion (13/145) of all ARI geography-year combinations because few sites have participated in ARI for so long. As a result, the model discounts the large estimated effects in these years because there are fewer cases added to the average treatment effect on the treated (ATT).¹⁰

¹⁰ The GSC models identify latent trends that exist in both treatment and control counties that are unexplained by other known factors. To test the validity of using a GSC model, the latent factors should be examined to determine the degree to which “the treated counterfactuals are produced by reliable interpretations instead of extrapolations” (Xu, 2017). SPAC re-estimates the model with ARI counties that do not have similar non-ARI counties removed and finds similar results (not shown) but with slightly larger standard errors due to fewer cases. The tests led to the conclusion that one possible confounding issue with the GSC is that the reduction in the ARI years is due to the non-ARI counties being mostly rural counties in which prison admissions increased in recent years. Additional information on these tests is available upon request.

Table 1. Generalized Synthetic Control Results

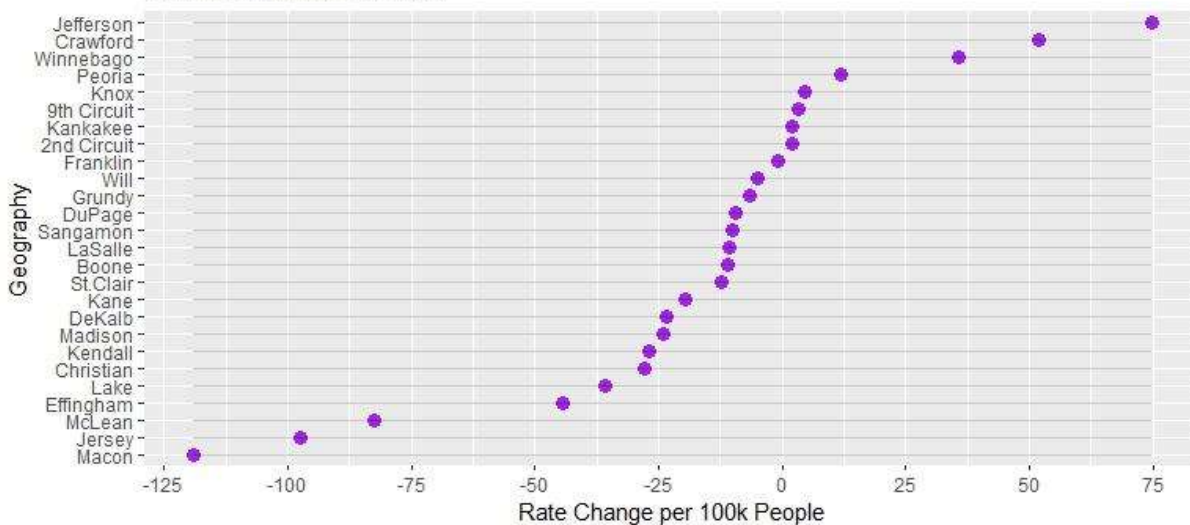
		GSC Prison Admissions Rate, no covariates		GSC Prison Admissions Rate, with covariates	
		ATT	s.e.	ATT	s.e.
Overall Average		-16.4	8.6	-14.1	6.5
Year	ARI Sites				
-9	-	-3.3	4.2	2.2	4.5
-8	-	-1.0	4.7	-1.0	4.5
-7	-	-3.4	4.7	-4.4	4.6
-6	-	6.2	5.0	5.7	4.7
-5	-	2.3	5.0	0.7	4.7
-4	-	0.0	5.1	-1.4	4.5
-3	-	-1.5	4.7	-2.3	4.3
-2	-	-3.1	4.1	-1.0	3.8
-1	-	4.7	4.5	1.9	4.0
0	-	-1.1	4.9	0.1	4.1
1	26	-19.2	6.3	-17.8	5.9
2	26	-15.4	7.8	-14.4	6.5
3	24	-8.8	8.5	-10.1	7.3
4	22	-17.7	9.9	-18.0	8.5
5	20	-2.8	11.8	-3.3	9.9
6	14	-6.7	15.8	-3.2	12.3
7	9	-50.8	21.6	-40.9	16.7
8	4	-69.4	36.0	-66.9	25.2

Median Rate Change by Site

Each site's effect varies, as seen in the second column in Table 1. However, some sites' effects are much larger or smaller than the average, as can be seen below in Figure 6. The median (site at exactly the 50th percentile) will be less affected by outlier years. The median of these medians is about -10 prison admissions per 100,000 people. This is roughly equal to a 9% drop in the prison admission rate for non-violent Class 3 and 4 offenses.

Figure 6 - Median Estimated Rate Change During ARI Years

GSC Results with Covariates



Regression Analysis of Convictions

ARI participation by counties should not only change prison admission rates but also decrease the probability of receiving a prison sentence for a Class 3 or 4 non-violent conviction. To answer this question, SPAC conducts a multilevel regression analysis on Class 3 and 4 non-violent convictions in counties that have had an ARI enrollment since 2009 to estimate the effect of ARI on the probability of prison. The outcome is the presence of a prison sentence without a probation sentence for each conviction.¹¹

Descriptive Statistics

To prepare the CHRI data, SPAC condensed Class 3 and 4 convictions from 2001 through 2017 into a single row per Document Control Number (DCN), which corresponds to a case initiated with an arrest. SPAC kept cases where the most severe conviction class was Class 3 and 4 and non-violent.¹² Descriptive statistics are available in Table 2 below.

Table 2. Descriptive Statistics – Class 3 and 4 Non-Violent Convictions

Variable	Values	Frequencies and Statistics (% of valid cases)	
Prison	No Prison	96,569	70.9%
	Prison	39,706	29.1%
ARI Possible	ARI Active	39,283	28.8%
	ARI Inactive	96,992	71.2%
County	DuPage	18,149	13.3%
	Lake	16,100	11.8%
	Kane	12,246	9.0%
	Will	11,290	8.3%
	Madison	10,646	7.8%
	Winnebago	10,298	7.6%
	Peoria	7,331	5.4%
	McLean	6,652	4.9%
	St. Clair	6,015	4.4%
	Macon	5,063	3.7%
	26 others	32,485	23.8%

¹¹ This definition isolates the effect of reducing the probability of prison sentences immediately following an eligible felony conviction. It assesses neither the probability of a conviction nor the probability of a county using ARI rather than prison for probation violations.

¹² Each case is defined as an arrest incident that involves a fingerprint in CHRI. Prior analysis found that 75% of the eligible ARI prison admissions were for Class 3 or 4 non-violent convictions.

Variable	Values	Frequencies and Statistics (% of valid cases)	
Class	3	45,240	33.2%
	4	91,035	66.8%
Arrest Age	Mean (sd): min < med < max:	32.1 (10.5) 18 < 30 < 75	
Race	Black	49,566	36.4%
	Non-Black	86,709	63.6%
Sex	Female	32,257	23.7%
	Male	104,018	76.3%
Months between arrest and conviction	Mean (sd): min < med < max:	7.3 (7.8) 0 < 4.6 < 36	
Weapons Offense	Not Weapons	129,982	95.4%
	Weapons	6,293	4.6%
Prior Arrests	Mean (sd): min < med < max:	7.9 (8.9) 0 < 5 < 155	
Prior Arrests Categorized	No Prior Arrests	14,290	10.5%
	1-2	25,868	19.0%
	3-5	37,978	27.9%
	6-9	18,038	13.2%
	10 plus	40,101	29.4%
Prior Convictions	Mean (sd): min < med < max:	3.1 (3.6) 0 < 2 < 64	
Prior Convictions Categorized	No Prior Convictions	31,060	22.8%
	1-2	45,774	33.6%
	3-5	40,902	30.0%
	6-9	10,626	7.8%
	10 plus	7,913	5.8%
Prior Prison Sentence	No Prior Prison	94,391	69.3%
	Prior Prison	41,884	30.7%
First Arrest as a Juvenile	No	92,398	67.8%
	Yes	43,877	32.2%

Model Two: Multilevel Logistic Regression Model Results

SPAC uses a multilevel model with a random intercept at the county level and for the conviction year as well as a random slope for the ARI effect on counties.¹³ Individual-level variables are:

- Offense Class (3 vs. 4)
- Black (black vs. non-black)¹⁴
- Male (male vs. female)
- Arrest age mean-centered¹⁵
- Years between the arrest and conviction mean-centered
- Weapons conviction indicator (any weapons conviction on the DCN)
- Any prior prison sentence indicator
- Prior arrests, categorized
- Prior convictions, categorized
- Juvenile arrest indicator (first arrest was prior to 18th birthday)

The results show convictions in counties with ARI had a 19% reduction in the odds of receiving a prison sentence for Class 3 or 4 non-violent convictions compared to when ARI was not active. The marginal effect over the entire data set was also calculated from the model, predicting the outcome for each observation and finding the change in probability. This arrives at a statistically significant 3.3 percentage point reduction.¹⁶ For context, the baseline probability of a prison sentence for Class 3 or 4 non-violent convictions is around 35%—thus a 3.3 percentage point reduction appears reasonable, especially as criminal justice stakeholders will exclude cases that they do not feel appropriate for ARI participation and because programs may have limited capacity.

¹³ At first, SPAC tried a fixed effect model but found the conviction year as a random effect predicted slightly more outcomes correctly. Using fixed effect specification reduced the overall ARI coefficient (odds ratio of 0.83, confidence interval of 0.71 – 0.97), but several of the county-level coefficients were unreasonable when compared to the GSC or DID models. Using random effects aligned most county-level odds ratios with the other models used, increasing SPAC’s confidence in the overall results.

¹⁴ Prior to 2014, Hispanic was often coded as White or Caucasian, making more detailed analysis impossible during this period.

¹⁵ Mean-centered means the coefficient represents the distance from the average age. For this arrest age variable, the number was divided by five to improve computational efficiency.

¹⁶ The results also lie within GSC results that also use CHRI conviction data (1.2% – 3.7% reduction) as an alternative to using prison admission rates.

Table 3. Multilevel Logistic Regression Results¹⁷

Probability of Prison Sentence for Class 3 or 4 Non-Violent Convictions	Multilevel, with control variables		Odds Ratio Results, Prison		
	Predictors	β	s.e	Odds Ratios	95% Confidence Interval
Intercept	-2.64	0.10	0.07	0.06 – 0.09	<0.001
ARI	-0.21	0.08	0.81	0.69 – 0.95	0.008
Class 4	-0.07	0.01	0.93	0.91 – 0.96	<0.001
Black	0.01	0.02	1.01	0.98 – 1.04	0.545
Male	0.40	0.02	1.49	1.44 – 1.55	<0.001
Arrest age	-0.07	0.00	0.93	0.92 – 0.94	<0.001
Years from arrest	0.01	0.01	1.01	0.99 – 1.03	0.519
Weapons offense	0.55	0.03	1.74	1.64 – 1.85	<0.001
Prior prison sentence	1.32	0.02	3.74	3.62 – 3.86	<0.001
1-2 prior arrests	0.14	0.04	1.15	1.06 – 1.24	0.001
3-5 prior arrests	0.69	0.04	1.99	1.84 – 2.16	<0.001
6-9 prior arrests	1.00	0.05	2.73	2.49 – 2.98	<0.001
10 plus prior arrests	1.27	0.05	3.55	3.23 – 3.89	<0.001
1-2 prior convictions	0.20	0.03	1.22	1.15 – 1.29	<0.001
3-5 prior convictions	0.31	0.03	1.37	1.28 – 1.46	<0.001
6-9 prior convictions	0.39	0.04	1.48	1.37 – 1.60	<0.001
10 plus prior convictions	0.63	0.04	1.88	1.72 – 2.05	<0.001
First arrest as juvenile	0.05	0.02	1.05	1.02 – 1.09	0.001

Conclusions

Overall, the full set of analyses conducted generally show a reduction in the Class 3 and 4 non-violent prison admission rate and proportion of convictions receiving a prison sentence after ARI begins in a county. **The actual size of the average reduction, while difficult to measure**

¹⁷ To read Table 4, the β column shows the logistic regression's results, which are then converted into an odds ratio in the third column. The odds ratio column is the likelihood of a prison sentence compared to the baseline estimate. Thus, for people convicted of Class 3 or 4 non-violent convictions after ARI becomes active in their county, their likelihood of a prison sentence is 81% of similar convictions that occurred before ARI began—a reduction of 19% in the probability of a prison sentence.

precisely, may vary between a small impact and something larger, but a point-estimate from both models indicates a relative reduction of about 11%. The county-level analyses identified that, while some counties seemed to have a large impact, some effects appeared to increase prison admissions. Overall, the average impact shows ARI enrollments *are* reducing prison admissions, but the results must still be caveated by data issues and some uncertainty regarding model design. The evidence in total points towards a reduction in prison use when ARI funding begins in a county.

The models show significant variation of the effect across sites, which would be expected given sites are operating different treatment modalities, selecting their own target populations, and designing their own strategies for implementing the program. **The estimates from these analyses generally show an impact—not excessively large nor trivially small.** Further, other factors are likely influencing Class 3 and 4 non-violent prison admissions (for example, the very large reductions in years 7 and 8 in Table 1 seem too large to be attributable to ARI) and therefore this analysis does not establish conclusively the exact magnitude of an ARI impact. Future research and analysis should further test the variances across the ARI sites, test the outcomes for the people who receive the ARI-funded services, and understand the causal mechanisms that drive the change.

Limitations and Future Research

This memorandum is not an outcome evaluation. An outcome evaluation is a full research study that gathers data from multiple sources, possibly conducts qualitative data collection, and rigorously tests hypotheses. Instead, this memorandum uses the state’s administrative data to answer a narrow operational question: Does prison use change for ARI counties? Additional research and testing could further test the variances across the ARI sites, test the outcomes for the people who receive ARI-funded services, and understand the causal mechanisms that drive the change.

This memorandum also does not discuss the costs or benefits of ARI. To assess costs and benefits, additional information would be needed, including the expected time spent in prison had ARI not been offered and a comparison in recidivism rates for those receiving ARI services and those who have similar characteristics but do not participate. Further research may provide answers to these questions and create a basis for a cost-benefit analysis.