Length of Incarceration and Recidivism

UNITED STATES SENTENCING COMMISSION

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EXECUTIVE SUMMARY

The purpose of this report is to examine the relationship between length of incarceration and recidivism. In this section, you will find information on the United States Sentencing Commission's previous recidivism research, key findings, and methodology.

INTRODUCTION

The United States Sentencing Commission began studying recidivism shortly after the enactment of the Sentencing Reform Act (SRA) of 1984.[1] Considerations of recidivism by federal offenders were central to the Commission's initial work. Past studies, together with ongoing multi-year research on this subject, advance the Commission's mission to conduct research on sentencing issues related to the purposes of sentencing set forth in the SRA.[2] Exemplifying this, the criminal history provisions in the *Guidelines Manual* were developed, in part, based on information regarding federal offenders' risk of recidivism. Information about recidivism is also relevant to the Commission's obligation to formulate sentencing policy that "reflect[s], to the extent practicable, advancement[s] in knowledge of human behavior as it relates to the criminal justice process."[3]

In 2016, the Commission began its current multi-publication recidivism series. The first publication, *Recidivism Among Federal Offenders: A Comprehensive Overview* (2016), examined recidivism among more than 25,000 federal offenders who were either released from federal prison or placed on a term of probation in 2005.[4] The Commission's report, *The Past Predicts the Future: Criminal History and Recidivism of Federal Offenders* (2017), studied the relationship between criminal history and recidivism.[5] The Commission's report, *The Effects of Aging on Recidivism Among Federal Offenders* (2017), analyzed the impact of aging on federal offender recidivism.[6] The Commission also released three reports that examined recidivism among specific groups of federal offenders: *Recidivism Among Federal Drug Trafficking Offenders* (2017), *Recidivism Among Federal Violent Offenders* (2019), and *Recidivism Among Federal Firearms Offenders* (2019).[7]

This study, the seventh in the recidivism series, examines the relationship between length of incarceration and recidivism. The Commission has commented on the effect of length of incarceration on recidivism in two of the prior publications in this series. In the *Recidivism Among Federal Offenders* report, the Commission found that offenders sentenced to relatively short terms of imprisonment — less than six months — had a lower recidivism rate than offenders serving longer sentences. Offenders sentenced to less than six months had a recidivism rate of 37.5 percent while offenders serving longer sentences had relatively stable recidivism rates ranging from 50.8 percent to 55.5 percent.[8] That study, however, did not control for factors that have been shown to be associated with recidivism, such as the type of instant federal offense of conviction, criminal history of the offender, or age of the offender at the time of release. In the *Recidivism Among Federal Drug Trafficking Offenders* report, the Commission found that there was little apparent association between the offender's sentence and recidivism rate.[9]

TABLE 1.

Three Potential Relationships Between Length of Incarceration and Recidivism

Relationship	Description
Incarceration is a specific **deterrent**.	As the length of **incarceration increases**, the likelihood of **recidivism decreases**.
Incarceration is **criminogenic**.	As the length of **incarceration increases**, the likelihood of **recidivism increases**.
No effect.	**No statistically significant relationship** between length of incarceration and recidivism is identified.[10]

Specifically, the recidivism rate for drug trafficking offenders sentenced to less than six months was only slightly lower than the recidivism rate for drug trafficking offenders serving longer sentences, 40.6 percent compared to a range of 47.8 percent to 55.6 percent. However, when the Criminal History Category of the drug trafficking offenders was considered, as the sentence length increased, the recidivism rate decreased. The Commission opined that the inverse relationship between sentence length and likelihood of recidivism within each Criminal History Category was likely attributable, at least in part, to the effect that age has on recidivism. This report expands on, and refines, these prior analyses to more thoroughly examine the relationship between length of incarceration and recidivism. In doing so, this report empirically explores three potential relationships that may exist between length of incarceration and recidivism: deterrent, criminogenic, or no effect (*See* Table 1).

Empirical research on the relationship between length of incarceration and recidivism is limited and insufficient for developing federal sentencing policy.[11] There are a limited number of studies on the subject and they present mixed results.[12] Further, a number of these studies are dated (*e.g.*, conducted prior to 2000), use less rigorous research designs, or present results on the relationship between incarceration and recidivism as a sub-analysis within a broader study.[13] Further, a number of the prior studies have methodological deficiencies relating to not controlling for offender age and, therefore, are not considered valid studies.[14]

The most recent study utilizing a rigorous research design was conducted by Professor Benjamin Meade and colleagues.[15] In their study, the authors found a deterrent effect for state offenders incarcerated for 61 months or longer compared to a similar group of offenders serving shorter periods of incarceration.[16] However, it is not known the degree to which their finding would generalize to the federal offender population.

The purpose of this report is to add to the limited research examining the effect of incarceration on reoffending within the federal population and thereby inform policy makers.[17]

KEY FINDINGS

The Commission consistently found that incarceration lengths of more than 120 months had a deterrent effect.

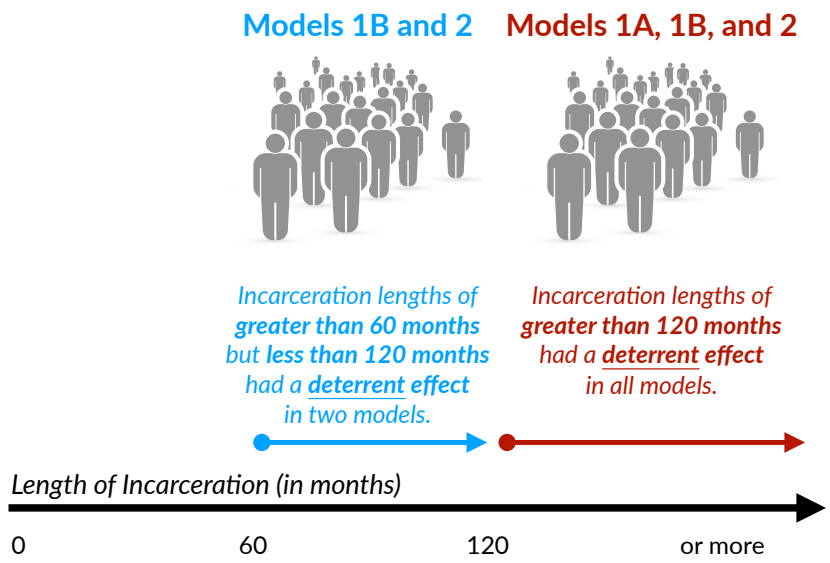
Each of the research designs estimated that offenders incarcerated for more than 120 months were less likely to recidivate eight years after release. In the two models with the larger sample sizes, offenders incarcerated for more than 120 months were approximately 30 percent less likely to recidivate relative to a comparison group receiving less incarceration. In the third model, offenders incarcerated for more than 120 months were approximately 45 percent less likely to recidivate relative to a comparison group receiving less incarceration.

In two models, the deterrent effect extended to incarceration lengths of more than 60 months.

Specifically, offenders incarcerated for more than 60 months up to 120 months were approximately 17 percent less likely to recidivate relative to a comparison group sentenced to a shorter period of incarceration.

For incarceration lengths of 60 months or less, the Commission did not find any statistically significant criminogenic or deterrent effect.

When focusing on the shortest period of incarceration studied (12 to 24 months), the research designs yielded varying results, neither of which were statistically significant nor sufficiently reliable to make evidence-based conclusions.



METHODOLOGY

This study utilized two research designs to analyze the relationship between length of incarceration and recidivism. Research design one focused on creating precisely matched comparison groups. Research design two focused on creating similar comparison groups while retaining a larger sample size.

Study Cohort

The study examines 25,431 federal offenders who were released into the community, either from federal prison or on probation, in calendar year 2005, and:

- who are citizens;
- whose pre-sentence investigation report was submitted to the Commission;
- who have valid FBI numbers;
- who were not reported dead, escaped, or detained; and
- whose federal sentence was not vacated.

The data was supplemented with Federal Bureau of Investigation criminal history records information to measure offenders' recidivism rates.

Recidivism

Recidivism "refers to a person's relapse into criminal behavior, often after the person receives sanctions or undergoes intervention for a previous crime."[18] Recidivism measures can provide policy makers with information regarding the relative threat to public safety posed by various types of offenders, and the effectiveness of public safety initiatives in deterring crime and rehabilitating offenders.[19] Recidivism measures are used by numerous public safety agencies to measure performance and inform policy decisions on issues such as pretrial detention, prisoner classification and programming, and offender supervision in the community.[20]

Two principal research choices can affect the relative magnitude of recidivism as measured in any study. First, researchers must determine which events will be considered as evidence of reversion to criminal behavior. Recidivism is typically measured by criminal acts that resulted in the rearrest, reconviction, or reincarceration of the offender over a specified period of time.[21] Second, researchers must decide the time period in which recidivism events are counted. The period of time over which events are counted following release into the community is the

"follow-up period." Recidivism analysis begins with a starting event, such as release from prison into the community, following which events, such as arrests, are recorded until the close of the follow-up period. In some studies, follow-up periods may be quite short (*e.g.*, six months), while other studies follow offenders for substantially longer periods (*e.g.*, several years). Longer follow-up periods tend to correspond with higher recidivism rates because offenders are tracked for lengthier periods of time. Consequently, longer follow-up periods provide a more accurate estimate of recidivism or desistance from crime.

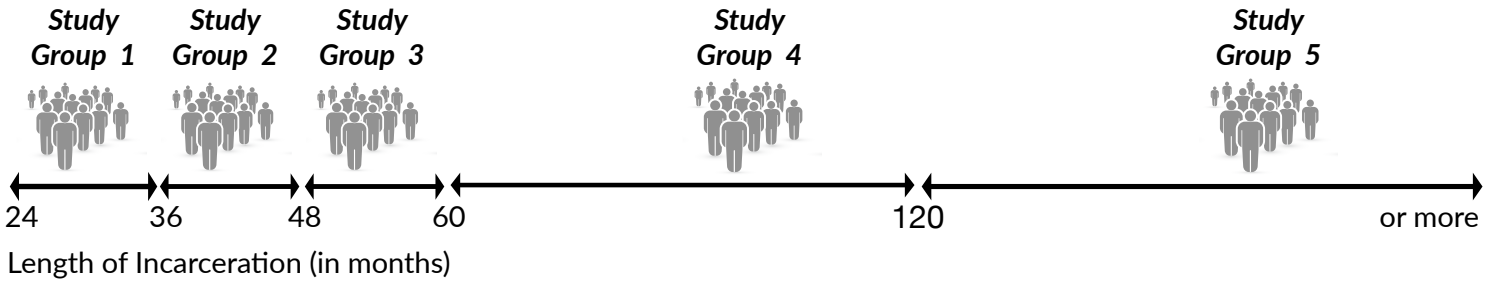
The Commission selected an eight-year follow-up period and identified rearrest as the recidivism event. Rearrest is the most reliably reported measure of recidivism and, consequently, is the primary indicator utilized by researchers.[22] Rearrest classifies a person as a recidivist if he or she has been arrested for a new crime after being released into the community directly on probation or after serving a term of imprisonment. Rearrest also includes arrests for alleged violations of supervised release, probation, or state parole.[23] Thus, any rearrest, apart from minor traffic offenses, was considered recidivism.

Study Groups

This study analyzes five ordered study groups receiving different lengths of incarceration (*see* Figure 1). The length of incarceration interval for each study group was determined based on natural timeframes and available sample size. The first three study groups are composed of offenders sentenced within one-year intervals: more than 24 months up to 36 months; more than 36 months up to 48 months; and more than 48 months up to 60 months. The fourth and fifth groups required larger timeframes due to a smaller number of offenders in each group. The decision to use five-to-ten and greater than ten years as the boundaries was to align with five-year clustering often seen in federal mandatory minimum sentences.[24]

Each study group is compared to a similar group of offenders who served shorter lengths of incarceration. The recidivism rate for individuals in the study groups were compared to the recidivism rate for individuals in the comparison groups. Exemplifying this, the recidivism rate for the study group incarcerated for more than 24 months up to 36 months was compared to a similar group of individuals serving periods of incarceration of 24 months or shorter. This process was replicated for each of the five study groups.

FIGURE 1.



Study Group	Length of Incarceration
1	>24-36 months
2	>36-48 months
3	>48-60 months
4	>60-120 months
5	>120 months

Doubly Robust Estimation

This study utilizes a two-stage process to analyze the effect of length of incarceration on recidivism. As detailed in the next section, the first step focuses on developing similar comparison groups for each study group through the use of matching and weighting techniques. In the second stage of the analysis, an outcome regression model—in this case multiple logistic regression—was used to estimate the effect of length of incarceration on recidivism.[25] This two-stage process of creating comparison groups and then utilizing regression modeling results in a *doubly robust estimation*, which is particularly powerful in that only one of the two models needs to be correctly specified to obtain unbiased estimates.[26]

Comparison Groups Using Matching and Weighting

The first stage of the analysis focuses on creating a similar comparison group for each study group. When creating a comparison group, researchers must consider two important factors: the necessary degree of similarity between study and comparison groups, and sample size. The study group and comparison group must be sufficiently similar on select attributes to isolate the effect of the variable of interest (*i.e.*, length of incarceration) on the outcome variable (*i.e.*, recidivism). Colloquially, this is often described as comparing *apples-to-apples*. The attributes selected by the researcher, called control variables, are generally important variables that are perceived to influence the outcome. For example, if the study and comparison groups have similar proportions of males, any difference in recidivism rates observed would not be attributed to gender. Here, the researcher would have *controlled* for gender in their model. Ideally, groups being compared would be identical on all attributes except for the variable of interest.

Sample size is also important because statistical tests require sample sizes large enough to detect existing relationships. This is referred to as *power* in statistics. Larger unbiased samples provide better estimates of how similar individuals not involved in the study will perform (*i.e.*, generalizable results). Therefore, in addition to similarity between groups, researchers must be cognizant of ensuring a sufficient sample size exists to detect a relationship between the variables of interest and outcome variable.

In this study, the Commission used a combination of *matching* and *weighting* to create comparison groups. Matching creates a comparison group by identifying individuals who are similar on key attributes determined by the researcher. The researcher specifies the level of precision for matches.[27] As the level of precision increases, it becomes more difficult to identify matches and, therefore, the sample size shrinks. Thus, researchers must balance the level of precision in matching with the subsequent sample size. With weighting, individuals in the comparison group who are similar to individuals in the study group are given more weight than individuals who are dissimilar. As the level of

similarity between matches increases, the weights increase.[28] One advantage of weighting, as compared to matching with a high degree of precision (*e.g.*, exact matching), is that it often results in a larger simple size because individuals with some dissimilarity will remain in the study but receive less weight.

The Commission chose to determine the length of incarceration for each study group and then create a matched comparison group for each study group. By determining the study groups' length of incarceration first and then developing comparison groups second, this study preserves the natural characteristics of offenders serving various lengths of incarceration. For example, in general, fraud offenders receive shorter sentences than drug trafficking offenders. This means the composition of offenders serving sentences longer than 120 months will, understandably, be different than the composition of offenders serving sentences of 24 to 36 months of incarceration.[29] While there will be some variation in the characteristics of offenders in each study group (*i.e.*, at various lengths of incarceration), the differences between study groups and comparison groups will be minimal due to matching or weighting.

With either matching or weighting, the first step is to determine which attributes must be controlled for. Researchers have identified five principal attributes that studies examining length of incarceration and recidivism must address: age, gender, race, prior criminal history, and instant offense type.[30] These prior recidivism studies have principally examined offenders sentenced in state courts. In its prior research studies, the Commission has confirmed that these factors are also associated with the recidivism of federal offenders. Specifically, as an offender's age-at-release increases recidivism decreases;[31] male offenders have higher recidivism rates than female offenders;[32] as an offender's criminal history category increases their recidivism rate increases;[33] and type of instant offense is associated with recidivism (*e.g.*, drug trafficking offenders have higher recidivism rates than fraud offenders).[34]

The Commission's prior research also identified associations between education level, violence, weapons offenses, and recidivism. The Commission found that offenders with higher levels of education have lower recidivism rates than offenders with lower levels of education.[35] The Commission also found that offenders who used violence in conjunction with the instant offense or who used violence in prior offenses have higher rates of recidivism than offenders who have never used violence in connection with an offense.[36] Additionally, the Commission found that offenders who commit weapons offenses have higher recidivism rates than offenders who commit other offenses.[37] Based on the Commission's prior research, and that conducted by other researchers, this report controls for the attributes listed in Table 2.

TABLE 2.

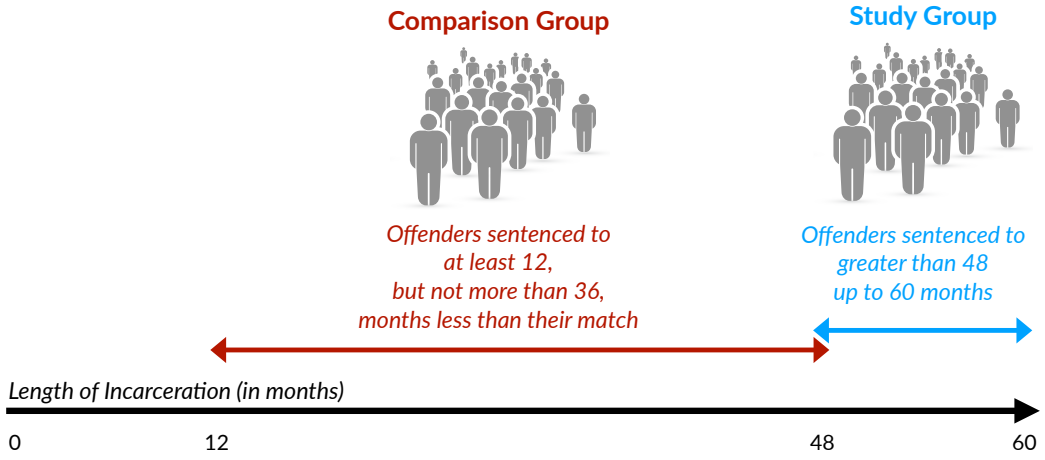
Control Attributes and Variables	
age-at-release	high school completion
gender	violent offense
race	weapons offense
criminal history category (CHC)	substantial assistance departure
instant offense type (sentencing guideline)	safety valve adjustment

This study controls for the attributes in Table 2 by ensuring the study and comparison groups are similar via matching or weighting and, subsequently, through a regression model. Consequently, any identified differences in recidivism rates between the study and comparison groups would not be attributed to the characteristics listed in Table 2.

This study used two research designs to develop similar comparison groups. The objective of the first design was to develop precisely matched comparison groups to analyze the effect of incarceration on recidivism. The objective of the second design was to develop comparison groups that were similar while retaining larger sample sizes to increase statistical power.

RESEARCH DESIGN 1 (A & B)

FIGURE 2. RESEARCH DESIGN 1A



The first research design utilized matching to develop a comparison group that exactly matched all characteristics in Table 2 except for age-at-release, which could vary by one year.[38] For example, if an individual in the study group had an age-at-release of 40, their match would be between the ages 39 to 41 at release. Thus, the study and comparison groups were almost identically matched on all attributes in Table 2.

In addition to the precise matching, individuals in the comparison group had to have a sentence of incarceration that was at least 12 months shorter than their match in the study group. This limitation avoids matching individuals with lengths of incarceration that are not meaningfully distinguishable, for example comparing an individual incarcerated for 49 months with an individual incarcerated for 48 months.

The Commission utilized two variations of research design one. In the first variation, Research Design 1A, in addition to having a sentence of incarceration *at least* 12 months shorter than their match, individuals in the comparison group could have *no more than* 36 months shorter length of incarceration (*see* Figure 2). The second restriction minimizes any concern that there may be attributes not accounted for in the design

FIGURE 3. RESEARCH DESIGN 1B

that impact length of incarceration. In other words, if two offenders are identically matched on all attributes in Table 2 but receive drastically different lengths of incarceration, it is possible that the difference in incarceration length is due to an unidentified attribute not accounted for in the research design. By requiring the comparison group to have similar lengths of incarceration (*i.e.*, no more than 36 months shorter), any attributes that were not formally controlled for, such as drug weight, should be similar. Thus, in Research Design 1A, the comparison group is comprised of individuals precisely matched on the attributes listed in Table 2 who had a sentence that was at least 12 months, but not more than 36 months, shorter than their match in the study group.

In the second variation of research design one, Research Design 1B, the 36 months maximum difference in the length of incarceration restriction was removed (*see* Figure 3). Removing this restriction recognizes that setting a 36 month limit excludes the possibility that greater differences in incarceration length more often result from the exercise of judicial discretion than the impact of an unidentified attribute. Further, removing this restriction addresses the concern that by applying the limitation, the marginal improvement in the exactness of the match between the two groups unduly limits the sample size and, consequently, the statistical power of the research design. Therefore, in Research Design 1B, the comparison group comprised individuals who matched on all attributes listed in Table 2 with an incarceration sentence at least 12 months shorter.

RESEARCH DESIGN 2

FIGURE 4. RESEARCH DESIGN 2

Research Design 2 utilized a combination of matching and weighting to create comparison groups. Specifically, the following attributes were matched exactly: age-at-release, gender, race, criminal history category, and primary sentencing guideline. Weighting was used to balance the remaining attributes: high school completion, violent offense, weapons offense, substantial assistance, and safety valve adjustment. After weighting, the study and comparison groups were assessed to confirm the groups were sufficiently similar.[39]

While the second research design controlled for the attributes listed in Table 2, it excluded the requirement that matches have incarceration lengths at least 12 months, but not more than 36 months, shorter. That is, the comparison group could include any individuals receiving a shorter period of incarceration (*see* Figure 4).

Regression Modeling

After establishing the comparison groups, multiple logistic regression was used to estimate the relationship between length of incarceration and recidivism. Logistic regression is a modeling technique used to analyze the relationship between attributes (*e.g.*, length of incarceration, age, gender, etc.) and a binary response variable (*e.g.*, recidivism).[40] In this study, logistic regression was used to analyze the relationship between length of incarceration and recidivism while controlling for the attributes listed in Table 2.

Logistic regression estimates the effects of variables on an outcome which is often reported as an *odds ratio*. In this study, the odds ratio represents the odds of recidivism for the study group as compared to the odds of recidivism for the comparison group. An odds ratio of one indicates no difference in recidivism between the groups. An odds ratio less than one indicates the study group had lower odds of recidivism than the comparison group. An odds ratio greater than one indicates the study group had greater odds of recidivism than the comparison group.[41]

In addition to producing an estimate, each estimate is tested for statistical significance. Testing estimates for statistical significance can be analogized to the burden of proof consideration in a criminal trial. The significance test begins with the premise that there is no relationship between the variables being tested, in this study length of incarceration and recidivism, similar to the premise that a defendant is innocent until proven guilty. In statistics, this presumption of innocence is referred to as the null hypothesis. The researcher collects data, or evidence, which is then judged to determine if the results of the analysis could have happened by random chance (*i.e.*, null hypothesis) or if the evidence suggest the relationship observed exists beyond a reasonable doubt. In statistics, the threshold of beyond reasonable doubt is usually numerically defined with a *p-value*. The p-value numerically defines the degree of evidence required to reject the null hypothesis and determine that a relationship between the variables exists beyond a reasonable doubt. In this study, the Commission used the conventional threshold of 0.05 to denote statistical significance. The threshold of less than 0.05 means that for an estimate to be statistically significant, the data collected must indicate a less than 5 percent chance that the null hypothesis is true (*i.e.*, that there is no true relationship between the variables).

The Commission considers findings that do not achieve a p-value less than 0.05 to be unreliable for policy making. Therefore, the Commission will not rely on a finding that length of incarceration has a deterrent or criminogenic effect if the p-value is 0.05 or greater.

RESEARCH FINDINGS

This section of the report explores three potential relationships that may exist between length of incarceration and recidivism (incarceration as having a deterrent effect, a criminogenic effect, or no effect on recidivism).

RESEARCH DESIGN 1A

In Research Design 1A, all attributes in Table 2 were exactly matched except for age-at-release, which could vary by one year. After matching, the sample size for Research Design 1A was 4,930 offenders across the five study groups (*see* Figure 5).

Figure 6 provides information on the average length of incarceration for each study and comparison group. Differences in the average length of incarceration range from 18.6 to 24.8 months. As expected, the average lengths of incarceration for the comparison groups are greater than 12, but not greater than 36, months shorter than the average length of incarceration for the corresponding study groups.

As noted, the Commission identified the study groups first and then created comparison groups in order to preserve the natural composition of offenders sentenced to various lengths of incarceration. Thus, in each study group, a matched or weighted comparison group of similar individuals was created. Between the study groups at various length of incarceration, there were some differences in the composition of offenders, as was expected. As the length of incarceration increased, the proportion of males increased, the proportion of Black offenders increased, the severity of CHC increased, and the proportion of §2D1.1 offenders increased (*see* Table 3).

FIGURE 5. SAMPLE SIZE

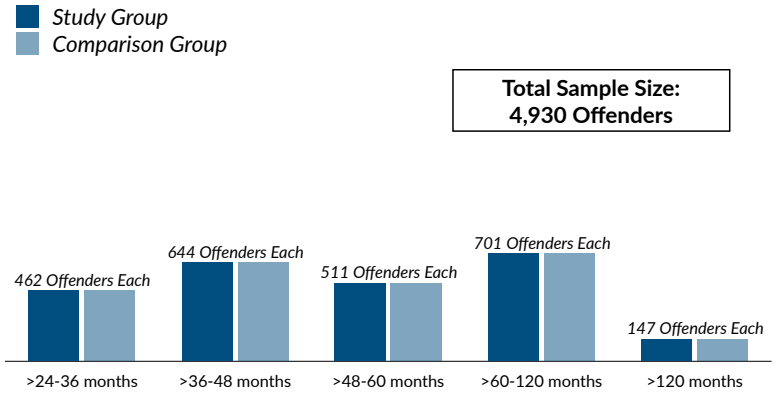


FIGURE 6. AVERAGE LENGTH OF INCARCERATION

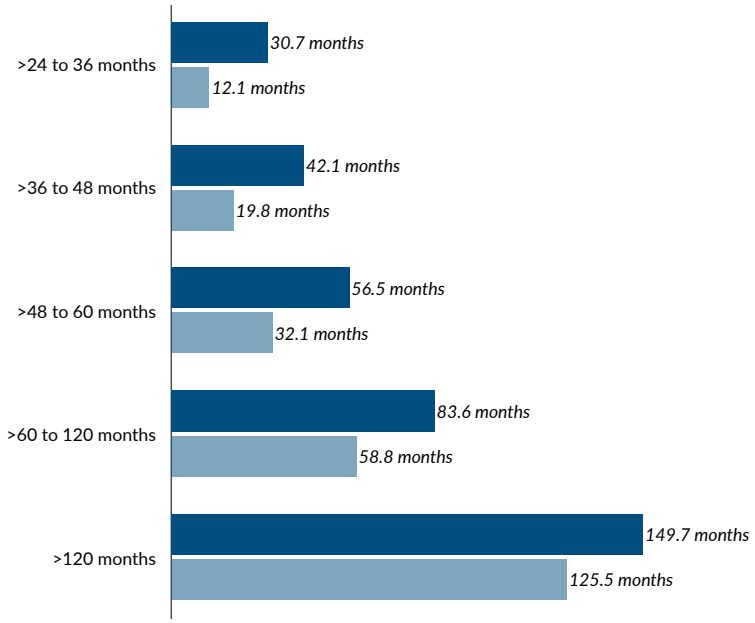


TABLE 3.

ATTRIBUTES	LENGTH OF INCARCERATION				
	>24-36 months	>36-48 months	>48-60 months	>60-120 months	>120 months
Age (years)					
Mean	36.3	35.5	35.4	36.5	38.8
Gender (%)					
Male	82.7	85.6	91.2	93.4	96.6
Female	17.3	14.4	8.8	6.6	3.4
Race (%)					
White	74.5	73.1	66.9	47.8	27.2
Black	24.0	23.4	31.9	51.5	72.8
Other	1.5	3.4	1.2	0.7	0.0
Criminal History Category (%)					
Category I	65.4	59.8	46.0	38.5	27.9
Category II	12.6	10.4	15.3	13.4	14.3
Category III	13.0	14.9	18.6	17.1	17.0
Category IV	4.1	8.1	10.6	12.1	8.8
Category V	1.3	3.9	3.7	7.3	10.9
Category VI	3.7	3.0	5.9	11.6	21.1
Primary Guideline (%)					
§2D1.1	35.5	51.1	67.3	76.2	84.4
§2B1.1	24.9	6.8	0.0	0.0	0.0
§2K2.1	18.8	26.1	19.6	10.6	0.0
§2F1.1	11.3	9.3	0.0	0.0	0.0
§2B3.1	0.0	0.0	0.0	9.4	0.0
Other	9.5	6.7	13.1	3.9	15.6

For each of the five study cohorts, multiple logistic regression was used to analyze the relationship between length of incarceration and recidivism while controlling for the attributes in Table 2. In Research Design 1A, one study group was identified as having a statistically significant relationship between length of incarceration and recidivism. Individuals serving sentences of more than 120 months incarceration had a statistically significant deterrent relationship between length of incarceration and recidivism. The regression model estimated individuals incarcerated for more than 120 months were approximately 45 percent less likely to recidivate as compared to a matched comparison group receiving an incarceration sentence that was at least 12 months shorter, but not more than 36 months shorter (*see* Figure 7).[42] This finding, a statistically significant deterrent relationship for offenders incarcerated for more than 120 months, was consistent across each of the research designs. In addition to estimating the likelihood of recidivism, time to rearrest was analyzed. The average time to rearrest for the study group was 962 days while the average time to rearrest for the comparison group was 946 days.[43]

In Research Design 1A, the model estimated that offenders sentenced to more than 24 to 36 months were 24 percent more likely to recidivate relative to a comparison group receiving a shorter sentence of incarceration (*see* Figure 8). This finding was not statistically significant, however, and is not sufficiently reliable for policy making. Further, as discussed below, there are substantial differences in the estimated effect of incarceration on recidivism for offenders in this study group across the three models. Therefore, no conclusion can be drawn as to the effect of length of incarceration on recidivism for offenders in this group.

FIGURE 7.

Example of Matched Offenders in Research Design 1A:
(sentenced to at least 12 months shorter but not more than 36 months shorter than their match)

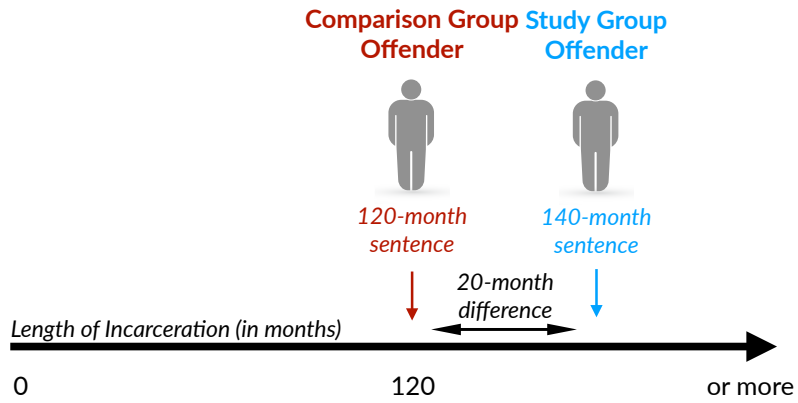
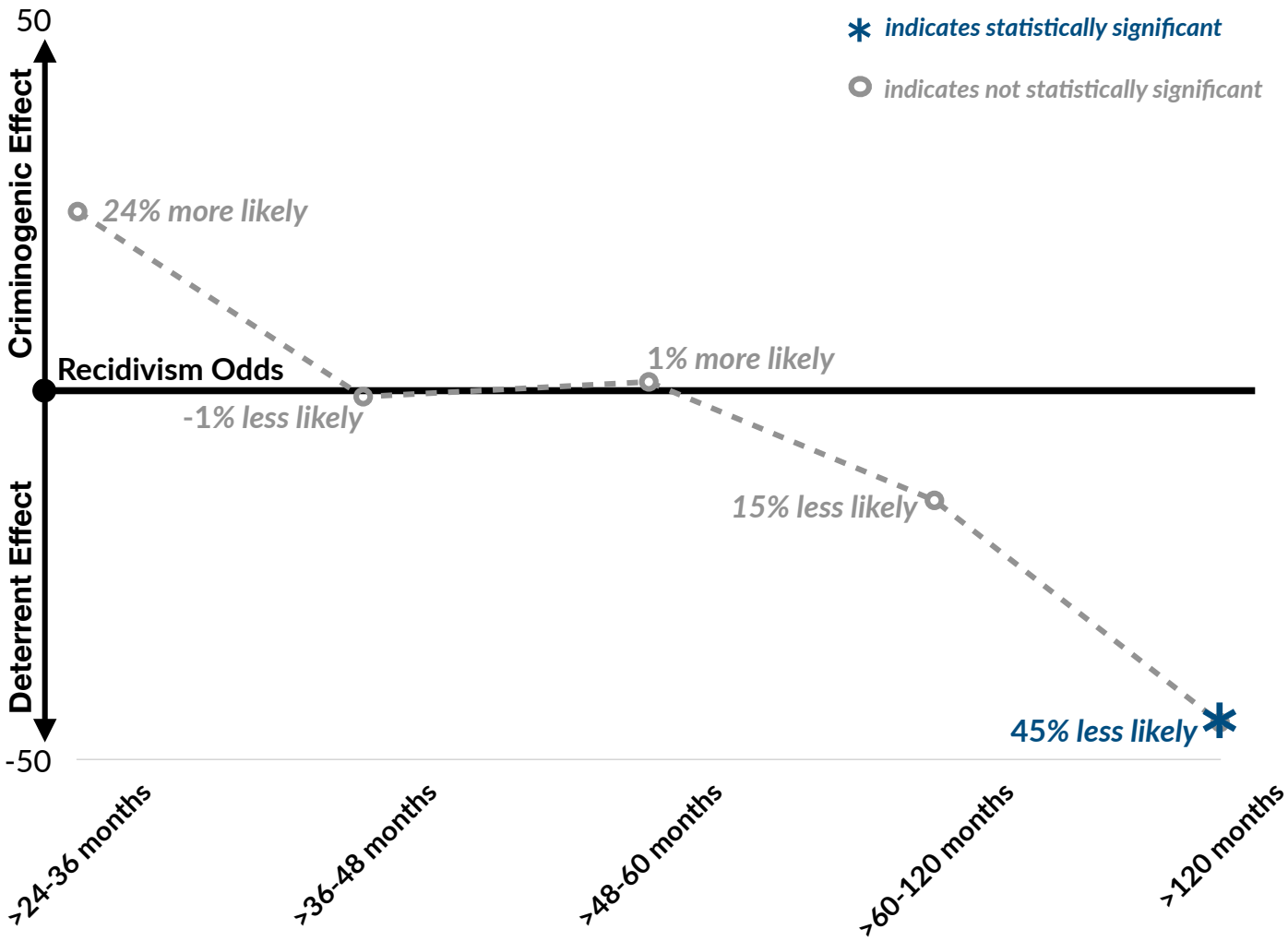


FIGURE 8.


50
-50
Criminogenic Effect
Deterrent Effect
Recidivism Odds
indicates statistically significant
indicates not statistically significant
24% more likely
-1% less likely
1% more likely
15% less likely
45% less likely
>24-36 months
>36-48 months
>48-60 months
>60-120 months
>120 months

RESEARCH DESIGN 1B

As discussed above, in Research Design 1B, the 36 month maximum difference in length of incarceration restriction was removed. Thus, for example, an individual incarcerated for 120 months could be compared to an individual incarcerated for 12 months. This restriction affected all study groups except for the first study group, those offenders with a sentence longer than 24 months up to 36 months.[44] Once the restriction was removed, the pool of individuals available for comparison increased and, therefore, the overall sample size increased. After matching, the sample size for Research Design 1B was 9,524 (*see* Figure 9), almost double the sample size for Research Design 1A.

Figure 10 provides information on the average length of incarceration for each study and comparison group. Differences in the average length of incarceration range from 18.6 to 97.8 months. As expected, once the 36 month maximum difference in length of incarceration restriction was removed, the differences in average length of incarceration between study and comparison groups increased as compared to Research Design 1A.

As noted, the Commission identified the study groups first and then created comparison groups second in order to preserve the natural composition of offenders sentenced to various lengths of incarceration. Thus, in each study group, a matched or weighted comparison group of similar individuals was created. Between the study groups at various length of incarceration, as

FIGURE 9. SAMPLE SIZE

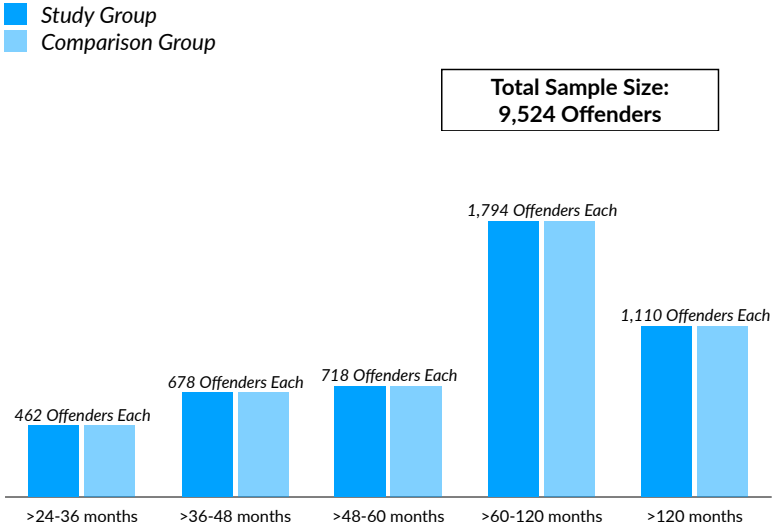


FIGURE 10. AVERAGE LENGTH OF INCARCERATION

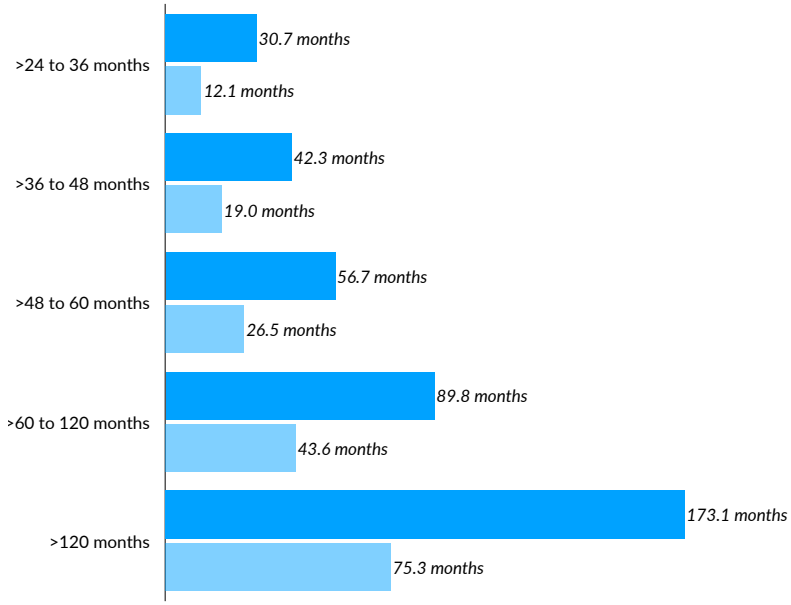


TABLE 4.

ATTRIBUTES	LENGTH OF INCARCERATION				
	>24-36 months	>36-48 months	>48-60 months	>60-120 months	>120 months
Age (years)					
Mean	36.3	35.7	35.2	36.7	39.7
Gender (%)					
Male	82.7	85.8	89.1	92.9	96.5
Female	17.3	14.2	10.9	7.1	3.5
Race (%)					
White	74.5	73.6	71.0	54.6	36.9
Black	24.0	23.0	27.6	44.3	62.4
Other	1.5	3.4	1.4	1.1	0.6
Criminal History Category (%)					
Category I	65.4	60.2	49.9	41.9	28.6
Category II	12.6	10.3	14.9	12.9	13.7
Category III	13.0	15.0	19.1	18.5	18.9
Category IV	4.1	7.8	8.1	10.8	11.5
Category V	1.3	3.7	3.1	6.7	6.6
Category VI	3.7	2.9	5.0	9.3	20.7
Primary Guideline (%)					
§2D1.1	35.5	51.9	69.6	78.6	84.4
§2B1.1	24.9	6.9	0.0	0.0	0.0
§2K2.1	18.8	25.4	16.3	10.8	5.5
§2F1.1	11.3	9.3	4.9	1.5	0.0
§2B3.1	0.0	0.0	0.0	6.2	9.1
Other	9.5	6.5	9.2	2.9	1.0

expected, there were some differences in the composition of offenders. Consistent with Research Design 1A, as the length of incarceration increased, the proportion of males increased, the proportion of Black offenders increased, the severity of CHC increased, and the proportion of §2D1.1 offenders increased (*see* Table 4).

In Research Design 1B, two study groups were identified as having statistically significant relationships between length of incarceration and recidivism. Individuals incarcerated for more than 120 months had a statistically significant deterrent relationship between length of incarceration and recidivism (*see* Figure 11). The regression model estimated individuals incarcerated for more than 120 months were approximately 30 percent less likely to recidivate as compared to a matched comparison group receiving at least 12 months shorter incarceration (*see* Figure 12).[45] In addition to estimating the likelihood of recidivism, time to rearrest was analyzed. The average time to rearrest for the study group was 955 days while the average time to rearrest for the comparison group was 847 days.[46]

Individuals incarcerated for a period of more than 60 up to 120 months had a statistically significant deterrent relationship between length of incarceration and recidivism. The regression model estimated individuals incarcerated for more than 60 up to 120 months were approximately 16 percent less likely to recidivate as compared to a matched comparison group receiving an incarceration sentence that was at least 12 months shorter. In addition to estimating the likelihood of recidivism, time to rearrest was analyzed. The average time to rearrest for the study group was 938 days while the average time to rearrest for the comparison group was 880 days.[47]

As noted, offenders in study group one (greater than 24 to 36 months) were the exact same in Research Designs 1A and 1B. Consequently, the model estimate for the first study group is the same for Research Designs 1A and 1B. Specifically, the model estimated that offenders sentenced to more than 24 months up to 36 months were 24 percent more likely to recidivate as compared to offenders whose sentence was at least 12 months shorter (*see* Figure 12). As discussed above, however, this finding was not statistically significant and is not sufficiently reliable for policy making. Further, as discussed below, there are substantial differences in the estimated effect of incarceration on recidivism for offenders in this study group between Research Designs 1A, 1B, and 2. Therefore, no conclusions can be drawn from the data about this group.

FIGURE 11.

Example of Matched Offenders in Research Design 1B:
(sentenced to at least 12 months shorter than their match)

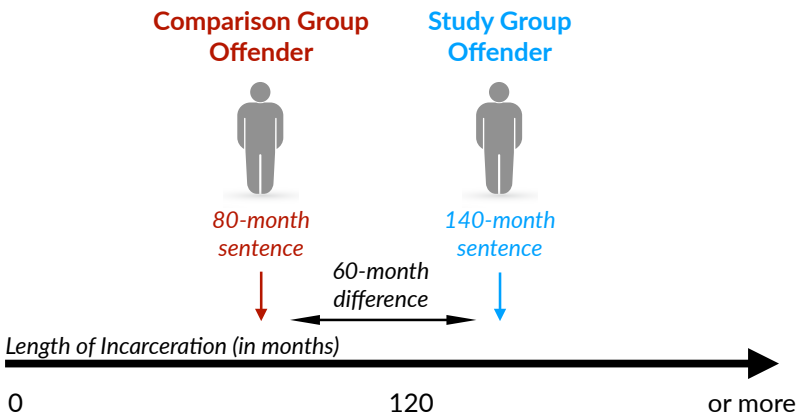
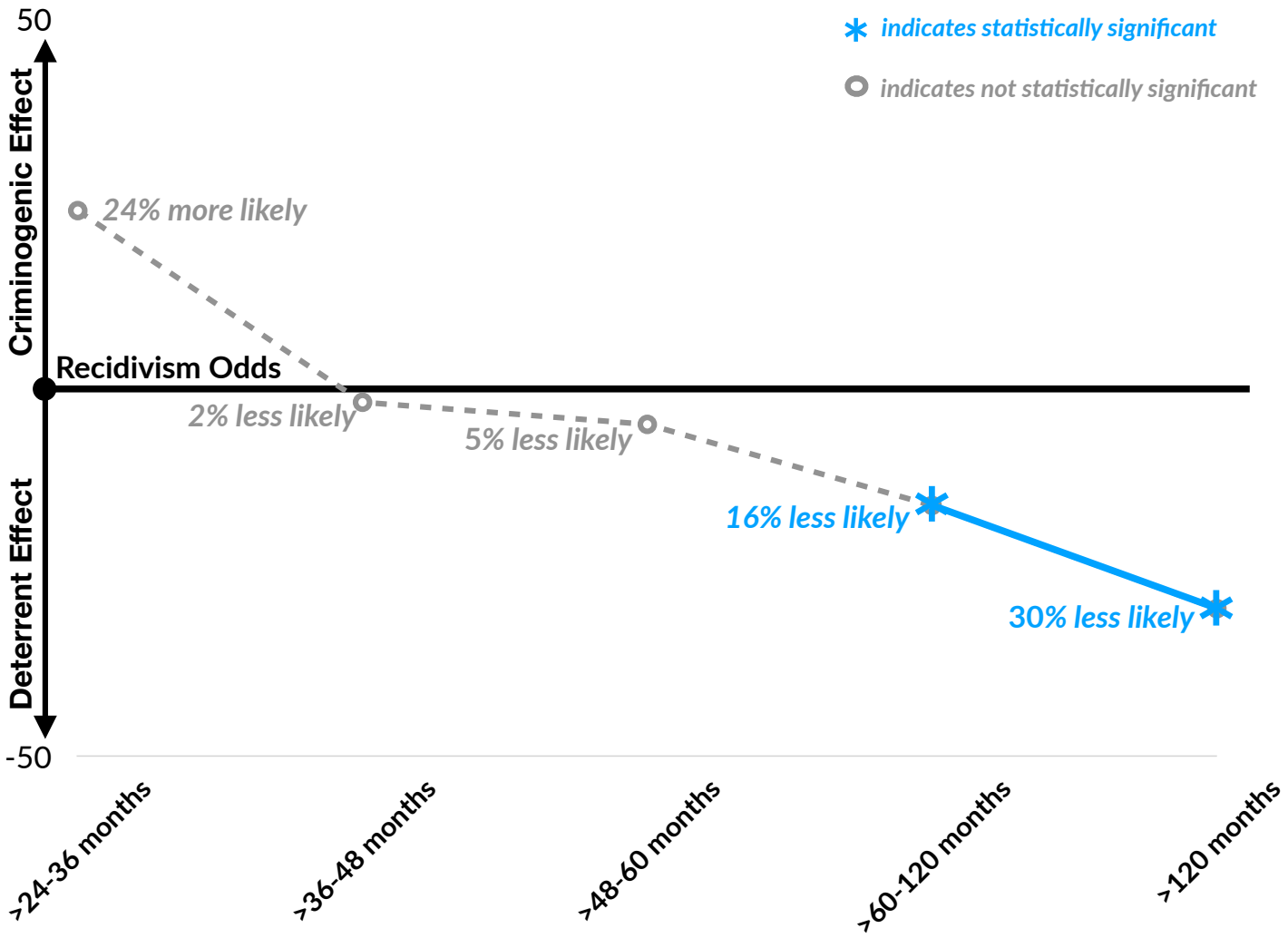


FIGURE 12.


50
-50
Criminogenic Effect
Deterrent Effect
Recidivism Odds
indicates statistically significant
indicates not statistically significant
24% more likely
2% less likely
5% less likely
16% less likely
30% less likely
>24-36 months
>36-48 months
>48-60 months
>60-120 months
>120 months

RESEARCH DESIGN 2

Research Design 2 focused on developing similar comparison groups while retaining a larger sample size. This design used a combination of matching and weighting to create the comparison groups. The comparison groups included individuals matched or weighted on all attributes listed in Table 2 who had a shorter length of incarceration.[48] The objective of Research Design 2, to create similar comparison groups and retain a larger sample size, was achieved. The total sample size for Research Design 2 was 16,800, much larger than the sample sizes of either Research Design 1A or 1B (*see* Figure 13).

Figure 14 provides information on the average length of incarceration for each study and comparison group. Differences in the average length of incarceration range from 14.6 to 100.3 months. The difference in average length of incarceration between study and comparison groups in Research Design 2 is comparable to the differences identified in Research Design 1B.

As noted, the Commission identified the study groups first and then created comparison groups second in order to preserve the natural composition of offenders sentenced to various lengths of incarceration. Thus, in each study group, a matched or weighted comparison group of similar individuals was created. Between the study groups at various length of incarceration, as expected, there were some differences in the composition of offenders. Consistent with the prior research designs, as the length of incarceration increased, the proportion of males increased, the

FIGURE 13. SAMPLE SIZE

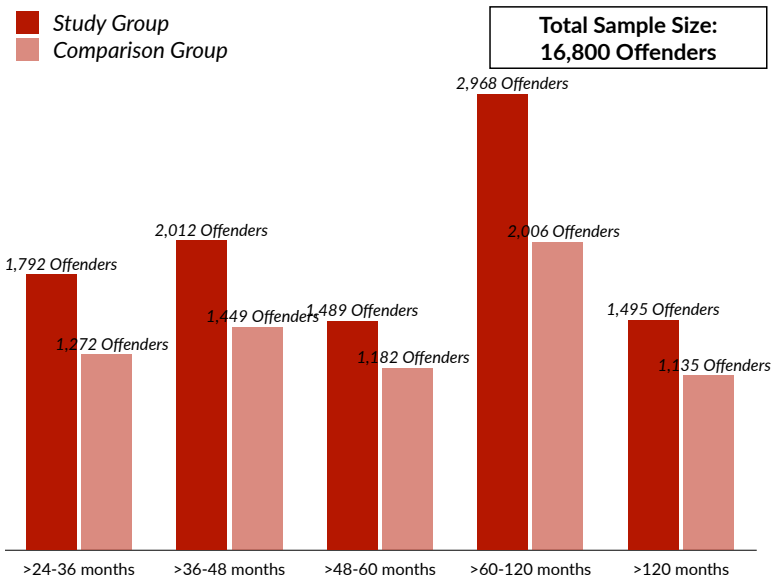


FIGURE 14. AVERAGE LENGTH OF INCARCERATION

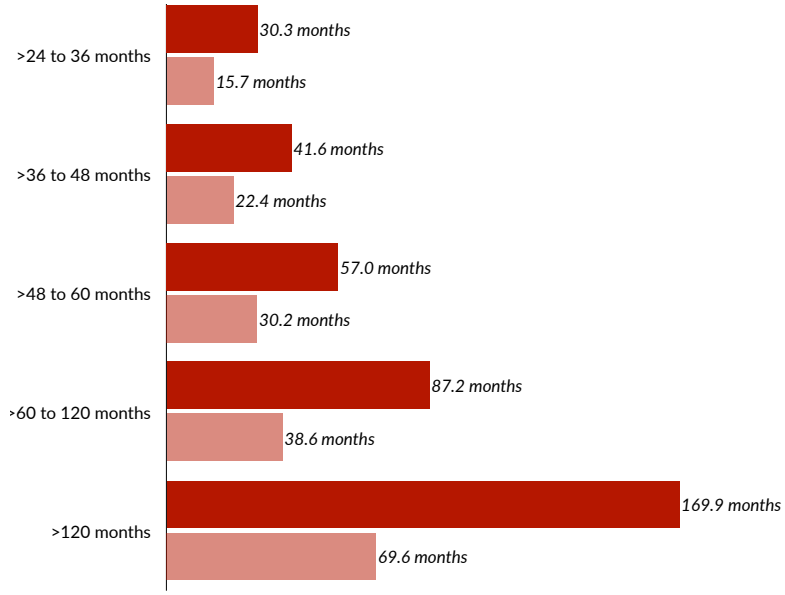


TABLE 5.

ATTRIBUTES	LENGTH OF INCARCERATION				
	>24-36 months	>36-48 months	>48-60 months	>60-120 months	>120 months
Age (years)					
Mean	35.2	35.2	35.5	36.7	40.0
Gender (%)					
Male	87.2	88.6	92.5	93.5	96.6
Female	12.8	11.4	7.5	6.5	3.4
Race (%)					
White	72.4	65.1	62.0	49.0	35.3
Black	25.8	32.6	37.0	50.1	64.1
Other	1.7	2.3	1.0	0.9	0.7
Criminal History Category (%)					
Category I	57.8	57.2	42.4	38.0	28.7
Category II	12.9	9.7	15.4	12.8	13.3
Category III	16.8	14.3	21.0	19.7	18.7
Category IV	7.1	10.4	10.4	11.2	11.2
Category V	2.3	3.3	4.1	6.6	5.8
Category VI	3.1	5.1	6.6	11.8	22.3
Primary Guideline (%)					
§2D1.1	50.1	65.9	74.7	82.6	84.2
§2B1.1	9.9	3.4	0.0	0.0	0.0
§2K2.1	22.9	21.3	14.4	10.2	6.4
§2F1.1	6.9	4.1	3.0	1.0	0.0
§2B3.1	0.0	0.0	3.1	3.9	8.6
§2G2.4	4.2	0.0	0.0	0.0	0.0
Other	6.0	5.3	4.8	1.3	0.9

proportion of Black offenders increased, the severity of CHC increased, and the proportion of §2D1.1 offenders increased (*see* Table 5).

In Research Design 2, two study cohorts were identified as having statistically significant relationships between length of incarceration and recidivism. Individuals incarcerated for more than 120 months had a statistically significant deterrent relationship between length of incarceration and recidivism. The regression model estimated individuals incarcerated for more than 120 months were approximately 29 percent less likely to recidivate relative to a comparison group receiving a shorter sentence of incarceration.[49] In addition to estimating the likelihood of recidivism, time to rearrest was analyzed. The average time to rearrest for the study group was 956 days while the average time to rearrest for the comparison group was 951 days.[50]

Individuals incarcerated for periods of more than 60 months up to 120 months also had a statistically significant deterrent relationship between length of incarceration and recidivism (*see* Figure 15). The regression model estimated that these individuals were 18 percent less likely to recidivate relative to a comparison group receiving a shorter sentence of incarceration (*see* Figure 16). In addition to estimating the likelihood of recidivism, time to rearrest was analyzed. The average time to rearrest for the study group was 955 days while the average time to rearrest for the comparison group was 893 days.[51]

In Research Design 2, the model estimated that offenders sentenced to more than 24 months up to 36 months were three percent more likely to recidivate (*see* Figure 16). This finding, however, was not statistically significant and is not sufficiently reliable for policy making. Further, this estimate is substantially different from the model estimates for Research Designs 1A and 1B (3% as compared to 24%). Therefore, no conclusions can be drawn from this data about this group.

FIGURE 15.

Example of Matched Offenders in Research Design 2:
(sentenced to a term shorter than their match)

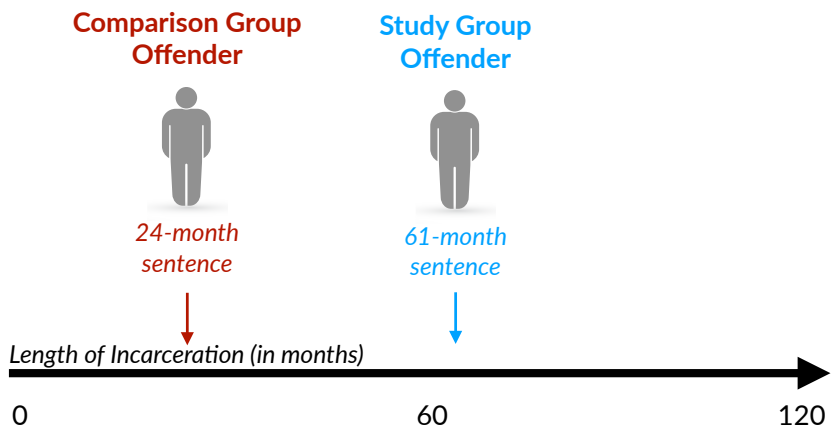
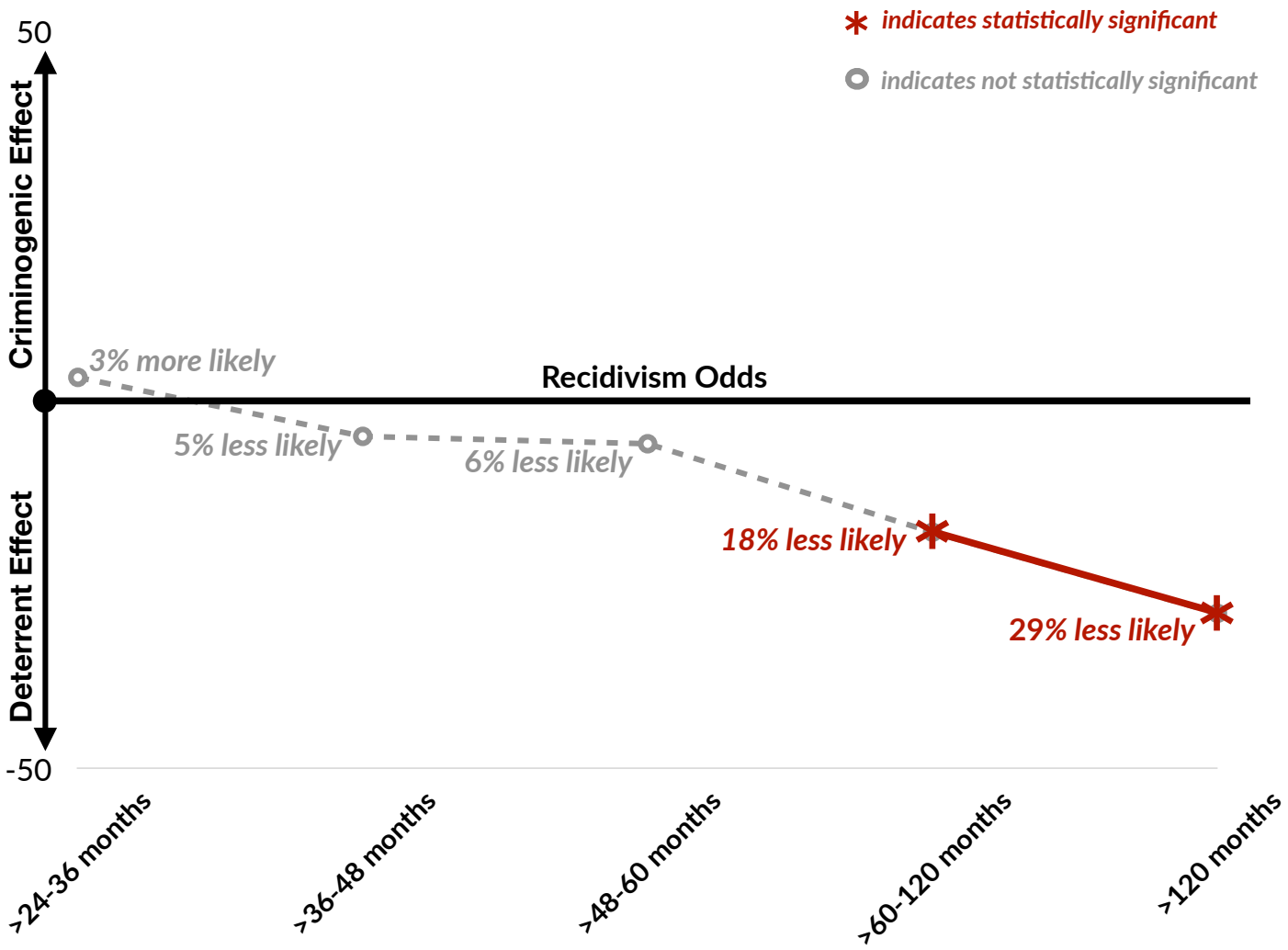


FIGURE 16.


indicates statistically significant
indicates not statistically significant
50
-50
Criminogenic Effect
Deterrent Effect
Recidivism Odds
3% more likely
5% less likely
6% less likely
18% less likely
29% less likely
>24-36 months
>36-48 months
>48-60 months
>60-120 months
>120 months

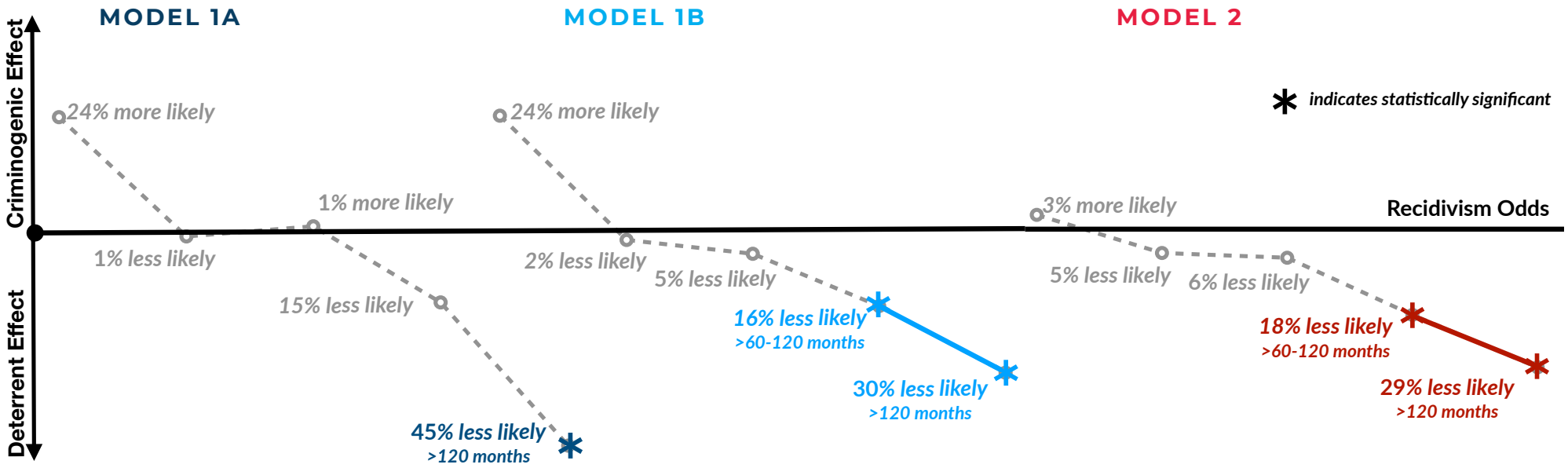
COMPARING MODELS

Each of the research models identified statistically significant deterrent relationships between length of incarceration and recidivism for individuals incarcerated for more than 120 months. Additionally, Research Designs 1B and 2 identified statistically significant deterrent relationships for individuals incarcerated for more than 60 up to 120 months. In comparing the regression models, there is a high degree of similarity between the statistically significant estimates for Research Designs 1B and 2 (the designs with larger sample sizes). Collectively, across all of the regression models, there appears to be consistency in the overall trend towards a deterrent effect for individuals incarcerated for longer than 60 months.

No statistically significant relationship between length of incarceration and recidivism was identified for offenders incarcerated for 60 months or less. The first study group, offenders sentenced to more than 24 to 36 months, were the only group of offenders with a sentence shorter than 60 months where any model estimated an effect on recidivism. However, as previously discussed, none of the model estimates for this study group were statistically significant and the estimates varied substantially. Consequently, because none of the estimates were statistically significant and the estimates varied widely between the models, the Commission has no basis to conclude that incarceration for more than 24 months up to 36 months has any effect on recidivism as compared to shorter periods of incarceration.

Figure 17 plots the estimated likelihood of recidivism for each of the study cohorts across the various research designs.[52] The horizontal axis plots each of the study cohorts, the vertical axis represents the likelihood of recidivism, and the red horizontal line at zero demarcates an increased likelihood of recidivism (above the line) with a decreased likelihood of recidivism (below the line). Statistically significant estimates are denoted by asterisk shapes. As Figure 17 illustrates, significant estimates for offenders incarcerated for greater than 60 to 120 months, and greater than 120 months, substantially overlap for Research Designs 1B and 2.

FIGURE 17.


MODEL 1A
MODEL 1B
MODEL 2
Criminogenic Effect
Deterrent Effect
Recidivism Odds
* indicates statistically significant
24% more likely
1% more likely
1% less likely
15% less likely
45% less likely
>120 months
24% more likely
2% less likely
5% less likely
16% less likely
>60-120 months
30% less likely
>120 months
3% more likely
5% less likely
6% less likely
18% less likely
>60-120 months
29% less likely
>120 months

CONCLUSION

The Commission initiated this study to better understand the relationship between length of incarceration and recidivism for federal offenders. There are three potential relationships between length of incarceration and recidivism: deterrent, criminogenic, and no effect. The Commission found a statistically significant deterrent effect for offenders incarcerated for more than 60 months when compared to similar offenders incarcerated for shorter periods of time. The Commission found no statistically significant effect for offenders sentenced to 60 months or less. Consequently, the Commission has no basis to conclude that incarceration for 60 months or less has a criminogenic or deterrent effect.

To analyze the relationship between length of incarceration and recidivism, five study cohorts were examined through three models. In all three models, offenders incarcerated for more than 120 months were identified as having a statistically significant deterrent relationship between incarceration and recidivism. For Research Designs 1B and 2, the models with larger sample sizes, offenders incarcerated for more than 120 months were estimated to be approximately 30 percent less likely to recidivate than those serving shorter periods of incarceration.[53] For Research Design 1A, offenders incarcerated for more than 120 months were estimated to be 45 percent less likely to recidivate. In two models, Research Designs 1B and 2, offenders incarcerated for more than 60 to 120 months were identified as having a statistically significant deterrent relationship between incarceration and recidivism. Specifically, offenders incarcerated for more than 60 months up to 120 months were estimated to be approximately 17 percent less likely to recidivate.[54]

In conclusion, this study suggests an inverse relationship between length of incarceration and recidivism for offenders serving more than 60 months incarceration. Federal offenders incarcerated for longer than 60 months had a lower recidivism rate than offenders with similar characteristics receiving shorter lengths of incarceration.

APPENDIX A

Appendix A provides information on the regression model estimates, in the form of odds ratios, for each of the five study groups across the various research designs. Only the estimate for the effect of length of incarceration on recidivism is presented. For the full regression models, see Appendices B, C, and D.

TABLE A-1.

Research Designs	
Design 1A	Research Design 1A used matching to develop comparison groups that exactly matched all attributes in Table 2 with the exception of age-at-release, which could vary by one year. Additionally, matches were required to have been sentenced to at least 12 months, but not more than 36 months, less incarceration.
Design 1B	Research Design 1B is the same as Research Design 1A, with the exception that individuals in the comparison group could have periods of incarceration that were more than 36 months shorter.
Design 2	Research Design 2 used matching and weighting to develop comparison groups similar on the attributes listed in Table 2 while retaining a larger sample size. There were no restrictions on length of incarceration for the comparison group (*e.g.*, a minimum 12 months less incarceration or a maximum of 36 less incarceration).

TABLE A-2.

Odds Ratio for Each Research Design					
	>24-36 months	**>36-48 months**	**>48-60 months**	**>60-120 months**	**>120 months**
Design 1A: Odds Ratio	1.24	0.99	1.01	0.85	0.55*
Design 1B: Odds Ratio	1.24	0.98	0.95	0.84*	0.70*
Design 2: Odds Ratio	1.03	0.95	0.94	0.82*	0.71*

APPENDIX B

Appendix B provides information on the full regression model for Research Design 1A, including: estimate, standard error, Z value, p-value, odds ratio, and 95 percent confidence interval for the odds ratio.

TABLE B-1.

Research Design 1A Study Cohort: >24-36 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	2.001	0.393	5.095	0.000			
Research Group							
Study vs. Comparison	0.217	0.151	1.432	0.152	1.24	0.92	1.67
Age-at-Release							
Age	-0.056	0.008	-7.005	0.000	0.94	0.93	0.96
Gender							
Female vs. Male	-0.784	0.218	-3.591	0.000	0.46	0.30	0.70
Race							
Black vs. White	0.546	0.195	2.808	0.005	1.73	1.18	2.53
Other vs. White	-0.419	0.693	-0.605	0.545	0.66	0.14	2.35
High School Completion							
Yes vs. No	-0.524	0.192	-2.727	0.006	0.59	0.40	0.86
Criminal History Category							
CHC II vs. CHC I	1.081	0.259	4.173	0.000	2.95	1.78	4.93
CHC III vs. CHC I	1.023	0.266	3.841	0.000	2.78	1.66	4.71
CHC IV vs. CHC I	1.377	0.419	3.282	0.001	3.96	1.79	9.39
CHC V vs. CHC I	1.531	0.694	2.206	0.027	4.62	1.30	21.70
CHC VI vs. CHC I	2.412	0.523	4.611	0.000	11.15	4.32	34.87
Guideline							
§2B1.1 vs. §2D1.1	-0.351	0.311	-1.130	0.259	0.70	0.38	1.29
§2K2.1 vs. §2D1.1	-0.293	0.316	-0.924	0.355	0.75	0.40	1.38
§2F1.1 vs. §2D1.1	-0.825	0.384	-2.151	0.031	0.44	0.20	0.92
Other vs. §2D1.1	-0.002	0.368	-0.005	0.996	1.00	0.48	2.05
Violence							
Yes vs. No	0.392	0.597	0.657	0.511	1.48	0.45	4.83
Weapons Adjustment							
Yes vs. No	0.282	0.788	0.358	0.720	1.33	0.29	7.07
Substantial Assistance							
Yes vs. No	-0.337	0.225	-1.502	0.133	0.71	0.46	1.11
Safety Valve							
Yes vs. No	0.044	0.290	0.153	0.879	1.04	0.59	1.85
-2 Log Likelihood		-516.592 (df = 20)					
McFadden Pseudo R^2		0.19					
N		924					

Response Variable: recidivism (rearrest)

TABLE B-2.

Research Design 1A Study Cohort: >36-48 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	1.233	0.336	3.671	0.000			
Research Group							
Study vs. Comparison	-0.008	0.127	-0.059	0.953	0.99	0.77	1.27
Age-at-Release							
Age	-0.043	0.007	-6.115	0.000	0.96	0.94	0.97
Gender							
Female vs. Male	-0.694	0.187	-3.705	0.000	0.50	0.34	0.72
Race							
Black vs. White	0.547	0.163	3.360	0.001	1.73	1.26	2.38
Other vs. White	0.100	0.352	0.283	0.777	1.10	0.55	2.21
High School Completion							
Yes vs. No	-0.292	0.139	-2.104	0.035	0.75	0.57	0.98
Criminal History Category							
CHC II vs. CHC I	0.615	0.246	2.494	0.013	1.85	1.14	3.00
CHC III vs. CHC I	1.137	0.240	4.732	0.000	3.12	1.95	5.02
CHC IV vs. CHC I	1.479	0.322	4.591	0.000	4.39	2.37	8.40
CHC V vs. CHC I	2.162	0.478	4.528	0.000	8.69	3.63	24.31
CHC VI vs. CHC I	3.518	0.764	4.606	0.000	33.70	9.36	217.39
Guideline							
§2B1.1 vs. §2D1.1	-0.229	0.340	-0.673	0.501	0.80	0.41	1.55
§2K2.1 vs. §2D1.1	0.185	0.243	0.764	0.445	1.20	0.75	1.94
§2F1.1 vs. §2D1.1	-0.615	0.328	-1.875	0.061	0.54	0.28	1.02
Other vs. §2D1.1	0.096	0.327	0.293	0.770	1.10	0.58	2.09
Violence							
Yes vs. No	0.332	0.348	0.955	0.340	1.39	0.71	2.80
Weapons Adjustment							
Yes vs. No	0.240	0.471	0.511	0.609	1.27	0.51	3.27
Substantial Assistance							
Yes vs. No	-0.212	0.168	-1.261	0.207	0.81	0.58	1.12
Safety Valve							
Yes vs. No	0.135	0.237	0.570	0.569	1.15	0.72	1.82
-2 Log Likelihood		-732.066 (df = 20)					
McFadden Pseudo R^2		0.18					
N		1,288					

Response Variable: recidivism (rearrest)

TABLE B-3.

Research Design 1A Study Cohort: >48-60 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	1.468	0.376	3.902	0.000			
Research Group							
Study vs. Comparison	0.010	0.142	0.067	0.947	1.01	0.76	1.33
Age-at-Release							
Age	-0.048	0.008	-5.758	0.000	0.95	0.94	0.97
Gender							
Female vs. Male	-0.692	0.253	-2.729	0.006	0.50	0.30	0.82
Race							
Black vs. White	0.557	0.168	3.318	0.001	1.75	1.26	2.43
Other vs. White	0.762	0.640	1.191	0.234	2.14	0.61	7.96
High School Completion							
Yes vs. No	-0.347	0.153	-2.268	0.023	0.71	0.52	0.95
Criminal History Category							
CHC II vs. CHC I	0.700	0.247	2.838	0.005	2.01	1.25	3.28
CHC III vs. CHC I	1.210	0.249	4.867	0.000	3.35	2.07	5.49
CHC IV vs. CHC I	1.649	0.326	5.060	0.000	5.20	2.78	10.00
CHC V vs. CHC I	1.817	0.484	3.750	0.000	6.15	2.50	17.04
CHC VI vs. CHC I	2.524	0.464	5.442	0.000	12.48	5.29	33.30
Guideline							
§2K2.1 vs. §2D1.1	-0.298	0.259	-1.153	0.249	0.74	0.45	1.23
Other vs. §2D1.1	-0.248	0.280	-0.887	0.375	0.78	0.45	1.35
Violence							
Yes vs. No	0.776	0.355	2.183	0.029	2.17	1.09	4.42
Weapons Adjustment							
Yes vs. No	0.361	0.295	1.223	0.221	1.44	0.81	2.58
Substantial Assistance							
Yes vs. No	-0.220	0.173	-1.274	0.203	0.80	0.57	1.13
Safety Valve							
Yes vs. No	-0.016	0.235	-0.068	0.946	0.98	0.62	1.56
-2 Log Likelihood		-582.255 (df = 18)					
McFadden Pseudo R^2		0.17					
N		1,022					

Response Variable: recidivism (rearrest)

TABLE B-4.

Research Design 1A Study Cohort: >60-120 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	1.837	0.378	4.866	0.000			
Research Group							
Study vs. Comparison	-0.163	0.121	-1.339	0.181	0.85	0.67	1.08
Age-at-Release							
Age	-0.066	0.008	-8.044	0.000	0.94	0.92	0.95
Gender							
Female vs. Male	-0.569	0.256	-2.220	0.026	0.57	0.34	0.93
Race							
Black vs. White	0.369	0.128	2.882	0.004	1.45	1.12	1.86
Other vs. White	0.866	0.763	1.136	0.256	2.38	0.56	12.29
High School Completion							
Yes vs. No	-0.324	0.130	-2.482	0.013	0.72	0.56	0.93
Criminal History Category							
CHC II vs. CHC I	0.853	0.225	3.790	0.000	2.35	1.51	3.66
CHC III vs. CHC I	0.929	0.212	4.387	0.000	2.53	1.68	3.85
CHC IV vs. CHC I	1.712	0.256	6.689	0.000	5.54	3.38	9.23
CHC V vs. CHC I	1.299	0.313	4.146	0.000	3.67	2.00	6.85
CHC VI vs. CHC I	2.023	0.277	7.299	0.000	7.56	4.43	13.16
Guideline							
§2K2.1 vs. §2D1.1	1.081	0.300	3.601	0.000	2.95	1.67	5.42
§2B3.1 vs. §2D1.1	0.900	0.871	1.033	0.301	2.46	0.33	11.80
Other vs. §2D1.1	0.655	0.370	1.769	0.077	1.92	0.92	3.95
Violence							
Yes vs. No	-0.568	0.842	-0.675	0.500	0.57	0.13	4.03
Weapons Adjustment							
Yes vs. No	0.136	0.195	0.695	0.487	1.15	0.78	1.68
Substantial Assistance							
Yes vs. No	-0.219	0.143	-1.529	0.126	0.80	0.61	1.06
Safety Valve							
Yes vs. No	0.299	0.221	1.351	0.177	1.35	0.88	2.08
-2 Log Likelihood		-797.333 (df = 19)					
McFadden Pseudo R^2		0.17					
N		1,402					

Response Variable: recidivism (rearrest)

TABLE B-5.

Research Design 1A Study Cohort: >120 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	0.664	1.001	0.663	0.507			
Research Group							
Study vs. Comparison	-0.592	0.267	-2.216	0.027	0.55	0.33	0.93
Age-at-Release							
Age	-0.029	0.020	-1.455	0.146	0.97	0.93	1.01
Gender							
Female vs. Male	-1.468	1.120	-1.311	0.190	0.23	0.01	1.46
Race							
Black vs. White	0.483	0.339	1.425	0.154	1.62	0.83	3.16
High School Completion							
Yes vs. No	-0.783	0.294	-2.665	0.008	0.46	0.26	0.81
Criminal History Category							
CHC II vs. CHC I	1.391	0.447	3.112	0.002	4.02	1.70	9.88
CHC III vs. CHC I	1.247	0.424	2.937	0.003	3.48	1.53	8.13
CHC IV vs. CHC I	1.309	0.526	2.489	0.013	3.70	1.35	10.74
CHC V vs. CHC I	1.876	0.539	3.483	0.000	6.53	2.34	19.55
CHC VI vs. CHC I	2.177	0.464	4.695	0.000	8.82	3.63	22.50
Guideline							
Other vs. §2D1.1	1.561	0.973	1.604	0.109	4.76	0.76	40.43
Violence							
Yes vs. No	-1.267	1.040	-1.218	0.223	0.28	0.03	2.02
Weapons Adjustment							
Yes vs. No	0.153	0.359	0.427	0.669	1.17	0.58	2.37
Substantial Assistance							
Yes vs. No	-0.780	0.361	-2.161	0.031	0.46	0.22	0.92
-2 Log Likelihood		-167.619 (df = 15)					
McFadden Pseudo R^2		0.17					
N		294					

Response Variable: recidivism (rearrest)

APPENDIX C

Appendix C provides information on the full regression model for Research Design 1B, including: estimate, standard error, Z value, p-value, odds ratio, and 95 percent confidence interval for the odds ratio.

TABLE C-1.

Research Design 1B Study Cohort: >24-36 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	2.001	0.393	5.095	0.000			
Research Group							
Study vs. Comparison	0.217	0.151	1.432	0.152	1.24	0.92	1.67
Age-at-Release							
Age	-0.056	0.008	-7.005	0.000	0.94	0.93	0.96
Gender							
Female vs. Male	-0.784	0.218	-3.591	0.000	0.46	0.30	0.70
Race							
Black vs. White	0.546	0.195	2.808	0.005	1.73	1.18	2.53
Other vs. White	-0.419	0.693	-0.605	0.545	0.66	0.14	2.35
High School Completion							
Yes vs. No	-0.524	0.192	-2.727	0.006	0.59	0.40	0.86
Criminal History Category							
CHC II vs. CHC I	1.081	0.259	4.173	0.000	2.95	1.78	4.93
CHC III vs. CHC I	1.023	0.266	3.841	0.000	2.78	1.66	4.71
CHC IV vs. CHC I	1.377	0.419	3.282	0.001	3.96	1.79	9.39
CHC V vs. CHC I	1.531	0.694	2.206	0.027	4.62	1.30	21.70
CHC VI vs. CHC I	2.412	0.523	4.611	0.000	11.15	4.32	34.87
Guideline							
§2B1.1 vs. §2D1.1	-0.351	0.311	-1.130	0.259	0.70	0.38	1.29
§2K2.1 vs. §2D1.1	-0.293	0.316	-0.924	0.355	0.75	0.40	1.38
§2F1.1 vs. §2D1.1	-0.825	0.384	-2.151	0.031	0.44	0.20	0.92
Other vs. §2D1.1	-0.002	0.368	-0.005	0.996	1.00	0.48	2.05
Violence							
Yes vs. No	0.392	0.597	0.657	0.511	1.48	0.45	4.83
Weapons Adjustment							
Yes vs. No	0.282	0.788	0.358	0.720	1.33	0.29	7.07
Substantial Assistance							
Yes vs. No	-0.337	0.225	-1.502	0.133	0.71	0.46	1.11
Safety Valve							
Yes vs. No	0.044	0.290	0.153	0.879	1.04	0.59	1.85
-2 Log Likelihood		-516.592 (df = 20)					
McFadden Pseudo R^2		0.19					
N		924					

Response Variable: recidivism (rearrest)

TABLE C-2.

Research Design 1B Study Cohort: >36-48 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	1.380	0.327	4.225	0.000			
Research Group							
Study vs. Comparison	-0.015	0.124	-0.119	0.905	0.98	0.77	1.26
Age-at-Release							
Age	-0.043	0.007	-6.461	0.000	0.96	0.94	0.97
Gender							
Female vs. Male	-0.714	0.184	-3.872	0.000	0.49	0.34	0.70
Race							
Black vs. White	0.547	0.160	3.417	0.001	1.73	1.26	2.37
Other vs. White	0.060	0.344	0.175	0.861	1.06	0.54	2.08
High School Completion							
Yes vs. No	-0.326	0.136	-2.403	0.016	0.72	0.55	0.94
Criminal History Category							
CHC II vs. CHC I	0.647	0.241	2.682	0.007	1.91	1.19	3.07
CHC III vs. CHC I	1.091	0.234	4.672	0.000	2.98	1.89	4.72
CHC IV vs. CHC I	1.411	0.315	4.482	0.000	4.10	2.24	7.72
CHC V vs. CHC I	2.158	0.476	4.529	0.000	8.65	3.63	24.18
CHC VI vs. CHC I	3.598	0.764	4.709	0.000	36.54	10.14	235.95
Guideline							
§2B1.1 vs. §2D1.1	-0.341	0.332	-1.027	0.304	0.71	0.37	1.36
§2K2.1 vs. §2D1.1	0.120	0.234	0.511	0.609	1.13	0.71	1.78
§2F1.1 vs. §2D1.1	-0.669	0.319	-2.099	0.036	0.51	0.27	0.95
Other vs. §2D1.1	0.035	0.322	0.110	0.912	1.04	0.55	1.94
Violence							
Yes vs. No	0.354	0.347	1.019	0.308	1.43	0.73	2.86
Weapons Adjustment							
Yes vs. No	0.061	0.449	0.136	0.892	1.06	0.44	2.59
Substantial Assistance							
Yes vs. No	-0.300	0.164	-1.822	0.069	0.74	0.54	1.02
Safety Valve							
Yes vs. No	0.065	0.229	0.282	0.778	1.07	0.68	1.67
-2 Log Likelihood		-768.934 (df = 20)					
McFadden Pseudo R^2		0.18					
N		1,356					

Response Variable: recidivism (rearrest)

TABLE C-3.

Research Design 1B Study Cohort: >48-60 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	1.663	0.294	5.653	0.000			
Research Group							
Study vs. Comparison	-0.050	0.118	-0.420	0.674	0.95	0.76	1.20
Age-at-Release							
Age	-0.050	0.007	-7.366	0.000	0.95	0.94	0.96
Gender							
Female vs. Male	-0.684	0.193	-3.545	0.000	0.50	0.34	0.73
Race							
Black vs. White	0.538	0.145	3.706	0.000	1.71	1.29	2.28
Other vs. White	0.703	0.499	1.408	0.159	2.02	0.77	5.56
High School Completion							
Yes vs. No	-0.348	0.129	-2.698	0.007	0.71	0.55	0.91
Criminal History Category							
CHC II vs. CHC I	0.597	0.206	2.900	0.004	1.82	1.22	2.73
CHC III vs. CHC I	1.021	0.201	5.080	0.000	2.78	1.88	4.13
CHC IV vs. CHC I	1.409	0.291	4.851	0.000	4.09	2.34	7.32
CHC V vs. CHC I	1.637	0.436	3.758	0.000	5.14	2.29	12.85
CHC VI vs. CHC I	2.383	0.417	5.712	0.000	10.83	5.02	26.24
Guideline							
§2K2.1 vs. §2D1.1	-0.129	0.221	-0.582	0.560	0.88	0.57	1.36
§2F1.1 vs. §2D1.1	-0.364	0.331	-1.101	0.271	0.70	0.36	1.32
Other vs. §2D1.1	0.065	0.266	0.244	0.807	1.07	0.63	1.80
Violence							
Yes vs. No	0.460	0.334	1.378	0.168	1.58	0.83	3.08
Weapons Adjustment							
Yes vs. No	0.289	0.268	1.076	0.282	1.34	0.79	2.27
Substantial Assistance							
Yes vs. No	-0.157	0.146	-1.082	0.279	0.85	0.64	1.14
Safety Valve							
Yes vs. No	-0.029	0.190	-0.154	0.877	0.97	0.67	1.41
-2 Log Likelihood		-836.399 (df = 19)					
McFadden Pseudo R^2		0.15					
N		1,436					

Response Variable: recidivism (rearrest)

TABLE C-4.

Research Design 1B Study Cohort: >60-120 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	1.823	0.216	8.450	0.000			
Research Group							
Study vs. Comparison	-0.170	0.074	-2.292	0.022	0.84	0.73	0.98
Age-at-Release							
Age	-0.055	0.005	-11.861	0.000	0.95	0.94	0.96
Gender							
Female vs. Male	-0.411	0.147	-2.793	0.005	0.66	0.50	0.88
Race							
Black vs. White	0.248	0.077	3.198	0.001	1.28	1.10	1.49
Other vs. White	0.475	0.365	1.302	0.193	1.61	0.80	3.36
High School Completion							
Yes vs. No	-0.411	0.078	-5.300	0.000	0.66	0.57	0.77
Criminal History Category							
CHC II vs. CHC I	0.642	0.138	4.656	0.000	1.90	1.45	2.49
CHC III vs. CHC I	0.857	0.129	6.647	0.000	2.36	1.83	3.04
CHC IV vs. CHC I	1.218	0.156	7.797	0.000	3.38	2.50	4.61
CHC V vs. CHC I	1.397	0.195	7.176	0.000	4.04	2.77	5.95
CHC VI vs. CHC I	1.795	0.180	9.989	0.000	6.02	4.25	8.61
Guideline							
§2K2.1 vs. §2D1.1	0.526	0.161	3.256	0.001	1.69	1.24	2.33
§2B3.1 vs. §2D1.1	-0.040	0.472	-0.084	0.933	0.96	0.36	2.34
§2F1.1 vs. §2D1.1	0.005	0.342	0.015	0.988	1.00	0.50	1.93
Other vs. §2D1.1	0.034	0.261	0.132	0.895	1.03	0.62	1.71
Violence							
Yes vs. No	0.299	0.443	0.674	0.500	1.35	0.59	3.41
Weapons Adjustment							
Yes vs. No	0.200	0.127	1.574	0.115	1.22	0.95	1.57
Substantial Assistance							
Yes vs. No	-0.309	0.090	-3.430	0.001	0.73	0.62	0.88
Safety Valve							
Yes vs. No	-0.044	0.130	-0.336	0.737	0.96	0.74	1.24
-2 Log Likelihood		-2120.155 (df = 20)					
McFadden Pseudo R^2		0.14					
N		3,588					

Response Variable: recidivism (rearrest)

TABLE C-5.

Research Design 1B Study Cohort: >120 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	1.625	0.303	5.372	0.000			
Research Group							
Study vs. Comparison	-0.360	0.094	-3.820	0.000	0.70	0.58	0.84
Age-at-Release							
Age	-0.054	0.006	-8.519	0.000	0.95	0.94	0.96
Gender							
Female vs. Male	-0.650	0.282	-2.309	0.021	0.52	0.29	0.89
Race							
Black vs. White	0.190	0.104	1.821	0.069	1.21	0.98	1.48
Other vs. White	0.465	0.598	0.779	0.436	1.59	0.49	5.34
High School Completion							
Yes vs. No	-0.199	0.098	-2.039	0.041	0.82	0.68	0.99
Criminal History Category							
CHC II vs. CHC I	0.461	0.154	2.993	0.003	1.58	1.17	2.14
CHC III vs. CHC I	0.839	0.142	5.916	0.000	2.31	1.75	3.06
CHC IV vs. CHC I	1.245	0.173	7.201	0.000	3.47	2.48	4.89
CHC V vs. CHC I	1.669	0.229	7.274	0.000	5.31	3.42	8.41
CHC VI vs. CHC I	1.757	0.162	10.876	0.000	5.80	4.24	7.98
Guideline							
§2K2.1 vs. §2D1.1	0.763	0.251	3.040	0.002	2.15	1.33	3.57
§2B3.1 vs. §2D1.1	0.585	0.637	0.919	0.358	1.80	0.51	6.44
Other vs. §2D1.1	0.263	0.485	0.543	0.587	1.30	0.49	3.34
Violence							
Yes vs. No	-0.002	0.618	-0.003	0.997	1.00	0.29	3.42
Weapons Adjustment							
Yes vs. No	-0.087	0.116	-0.746	0.456	0.92	0.73	1.15
Substantial Assistance							
Yes vs. No	0.070	0.130	0.542	0.588	1.07	0.83	1.38
Safety Valve							
Yes vs. No	0.165	0.272	0.607	0.544	1.18	0.69	2.00
-2 Log Likelihood		-1320.811 (df = 19)					
McFadden Pseudo R^2		0.14					
N		2,220					

Response Variable: recidivism (rearrest)

APPENDIX D

Appendix D provides information on the full regression model for Research Design 2, including: estimate, standard error, Z value, p-value, odds ratio, and 95 percent confidence interval for the odds ratio.

TABLE D-1.

Research Design 2 Study Cohort: >24-36 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	1.812	0.220	8.251	0.000			
Research Group							
Study vs. Comparison	0.034	0.084	0.406	0.684	1.03	0.88	1.22
Age-at-Release							
Age	-0.053	0.005	-11.521	0.000	0.95	0.94	0.96
Gender							
Female vs. Male	-0.611	0.128	-4.782	0.000	0.54	0.42	0.70
Race							
Black vs. White	0.357	0.106	3.370	0.001	1.43	1.16	1.76
Other vs. White	0.081	0.316	0.257	0.797	1.08	0.58	2.02
High School Completion							
Yes vs. No	-0.605	0.092	-6.596	0.000	0.55	0.46	0.65
Criminal History Category							
CHC II vs. CHC I	0.751	0.150	5.012	0.000	2.12	1.58	2.84
CHC III vs. CHC I	1.114	0.151	7.384	0.000	3.04	2.27	4.10
CHC IV vs. CHC I	1.783	0.220	8.094	0.000	5.95	3.90	9.27
CHC V vs. CHC I	1.971	0.348	5.664	0.000	7.17	3.75	14.83
CHC VI vs. CHC I	2.523	0.345	7.308	0.000	12.46	6.58	25.75
Guideline							
§2B1.1 vs. §2D1.1	-0.114	0.184	-0.618	0.536	0.89	0.62	1.28
§2K2.1 vs. §2D1.1	0.135	0.146	0.927	0.354	1.15	0.86	1.52
§2F1.1 vs. §2D1.1	-0.396	0.222	-1.782	0.075	0.67	0.43	1.03
§2G2.4 vs. §2D1.1	0.372	0.237	1.568	0.117	1.45	0.91	2.31
Other vs. §2D1.1	-0.177	0.213	-0.831	0.406	0.84	0.55	1.27
Violence							
Yes vs. No	0.488	0.228	2.139	0.032	1.63	1.04	2.56
Weapons Adjustment							
Yes vs. No	0.588	0.297	1.983	0.047	1.80	1.01	3.25
Substantial Assistance							
Yes vs. No	0.020	0.101	0.196	0.844	1.02	0.84	1.25
Safety Valve							
Yes vs. No	0.032	0.145	0.221	0.825	1.03	0.78	1.37
-2 Log Likelihood		-1812.253 (df = 21)					
McFadden Pseudo R^2		0.14					
N		3,064					

Response Variable: recidivism (rearrest)

TABLE D-2.

Research Design 2 Study Cohort: >36-48 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	1.527	0.216	7.081	0.000			
Research Group							
Study vs. Comparison	-0.054	0.077	-0.699	0.485	0.95	0.81	1.10
Age-at-Release							
Age	-0.049	0.004	-10.894	0.000	0.95	0.94	0.96
Gender							
Female vs. Male	-0.438	0.120	-3.644	0.000	0.64	0.51	0.82
Race							
Black vs. White	0.157	0.086	1.825	0.068	1.17	0.99	1.38
Other vs. White	0.212	0.244	0.868	0.385	1.24	0.76	2.00
High School Completion							
Yes vs. No	-0.379	0.080	-4.712	0.000	0.68	0.58	0.80
Criminal History Category							
CHC II vs. CHC I	0.792	0.158	5.004	0.000	2.21	1.62	3.02
CHC III vs. CHC I	0.994	0.150	6.624	0.000	2.70	2.02	3.63
CHC IV vs. CHC I	1.451	0.187	7.770	0.000	4.27	2.97	6.18
CHC V vs. CHC I	2.029	0.308	6.587	0.000	7.60	4.27	14.38
CHC VI vs. CHC I	2.585	0.276	9.377	0.000	13.26	7.91	23.41
Guideline							
§2B1.1 vs. §2D1.1	-0.003	0.256	-0.013	0.990	1.00	0.60	1.65
§2K2.1 vs. §2D1.1	0.289	0.135	2.142	0.032	1.34	1.02	1.74
§2F1.1 vs. §2D1.1	-0.423	0.248	-1.705	0.088	0.66	0.40	1.06
Other vs. §2D1.1	0.042	0.206	0.203	0.839	1.04	0.69	1.56
Violence							
Yes vs. No	0.009	0.219	0.042	0.967	1.01	0.66	1.55
Weapons Adjustment							
Yes vs. No	0.365	0.208	1.756	0.079	1.44	0.96	2.17
Substantial Assistance							
Yes vs. No	-0.111	0.097	-1.149	0.251	0.90	0.74	1.08
Safety Valve							
Yes vs. No	0.032	0.133	0.242	0.808	1.03	0.80	1.34
-2 Log Likelihood		-2108.683 (df = 20)					
McFadden Pseudo R^2		0.19					
N		3,461					

Response Variable: recidivism (rearrest)

TABLE D-3.

Research Design 2 Study Cohort: >48-60 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	1.808	0.228	7.930	0.000			
Research Group							
Study vs. Comparison	-0.063	0.087	-0.722	0.471	0.94	0.79	1.11
Age-at-Release							
Age	-0.053	0.005	-10.117	0.000	0.95	0.94	0.96
Gender							
Female vs. Male	-0.670	0.168	-3.994	0.000	0.51	0.37	0.71
Race							
Black vs. White	0.197	0.094	2.088	0.037	1.22	1.01	1.46
Other vs. White	0.279	0.417	0.670	0.503	1.32	0.59	3.05
High School Completion							
Yes vs. No	-0.210	0.090	-2.331	0.020	0.81	0.68	0.97
Criminal History Category							
CHC II vs. CHC I	0.531	0.144	3.693	0.000	1.70	1.28	2.26
CHC III vs. CHC I	0.600	0.135	4.437	0.000	1.82	1.40	2.38
CHC IV vs. CHC I	1.388	0.190	7.292	0.000	4.01	2.77	5.86
CHC V vs. CHC I	1.545	0.280	5.519	0.000	4.69	2.75	8.29
CHC VI vs. CHC I	2.045	0.253	8.087	0.000	7.73	4.78	12.93
Guideline							
§2K2.1 vs. §2D1.1	0.076	0.159	0.475	0.635	1.08	0.79	1.48
§2B3.1 vs. §2D1.1	0.508	0.373	1.364	0.173	1.66	0.80	3.47
§2F1.1 vs. §2D1.1	-0.466	0.284	-1.638	0.101	0.63	0.36	1.08
Other vs. §2D1.1	-0.499	0.227	-2.202	0.028	0.61	0.39	0.94
Violence							
Yes vs. No	0.248	0.261	0.948	0.343	1.28	0.77	2.16
Weapons Adjustment							
Yes vs. No	0.066	0.163	0.405	0.685	1.07	0.78	1.47
Substantial Assistance							
Yes vs. No	-0.105	0.103	-1.023	0.307	0.90	0.74	1.10
Safety Valve							
Yes vs. No	-0.213	0.136	-1.566	0.117	0.81	0.62	1.05
-2 Log Likelihood		-1707.807 (df = 20)					
McFadden Pseudo R^2		0.16					
N		2,671					

Response Variable: recidivism (rearrest)

TABLE D-4.

Research Design 2 Study Cohort: >60-120 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	1.740	0.190	9.168	0.000			
Research Group							
Study vs. Comparison	-0.198	0.065	-3.036	0.002	0.82	0.72	0.93
Age-at-Release							
Age	-0.055	0.004	-13.588	0.000	0.95	0.94	0.95
Gender							
Female vs. Male	-0.521	0.132	-3.947	0.000	0.59	0.46	0.77
Race							
Black vs. White	0.267	0.067	4.007	0.000	1.31	1.15	1.49
Other vs. White	0.601	0.325	1.847	0.065	1.82	0.97	3.50
High School Completion							
Yes vs. No	-0.345	0.066	-5.247	0.000	0.71	0.62	0.81
Criminal History Category							
CHC II vs. CHC I	0.632	0.114	5.539	0.000	1.88	1.50	2.36
CHC III vs. CHC I	0.969	0.105	9.239	0.000	2.64	2.15	3.24
CHC IV vs. CHC I	1.370	0.130	10.580	0.000	3.94	3.06	5.08
CHC V vs. CHC I	1.628	0.171	9.494	0.000	5.09	3.66	7.17
CHC VI vs. CHC I	2.012	0.145	13.870	0.000	7.48	5.64	9.97
Guideline							
§2K2.1 vs. §2D1.1	0.487	0.144	3.372	0.001	1.63	1.23	2.17
§2B3.1 vs. §2D1.1	0.160	0.315	0.508	0.612	1.17	0.63	2.16
§2F1.1 vs. §2D1.1	-0.166	0.380	-0.437	0.662	0.85	0.39	1.74
§2S1.1 vs. §2D1.1	-0.713	0.442	-1.614	0.106	0.49	0.19	1.09
Other vs. §2D1.1	0.177	0.306	0.577	0.564	1.19	0.65	2.16
Violence							
Yes vs. No	0.123	0.268	0.459	0.646	1.13	0.68	1.94
Weapons Adjustment							
Yes vs. No	0.231	0.101	2.294	0.022	1.26	1.03	1.54
Substantial Assistance							
Yes vs. No	-0.244	0.074	-3.310	0.001	0.78	0.68	0.90
Safety Valve							
Yes vs. No	0.076	0.108	0.702	0.483	1.08	0.87	1.33
-2 Log Likelihood		-3063.791 (df = 21)					
McFadden Pseudo R^2		0.16					
N		4,974					

Response Variable: recidivism (rearrest)

TABLE D-5.

Research Design 2 Study Cohort: >120 months							
						95% CI	
Term	**Estimate**	**Standard Error**	**Z Value**	**p-value**	**Odds Ratio**	**Lower**	**Upper**
(Intercept)	1.753	0.288	6.075	0.000			
Research Group							
Study vs. Comparison	-0.348	0.088	-3.948	0.000	0.71	0.59	0.84
Age-at-Release							
Age	-0.052	0.006	-8.950	0.000	0.95	0.94	0.96
Gender							
Female vs. Male	-1.125	0.286	-3.933	0.000	0.32	0.18	0.56
Race							
Black vs. White	0.149	0.099	1.515	0.130	1.16	0.96	1.41
Other vs. White	0.208	0.500	0.417	0.677	1.23	0.45	3.28
High School Completion							
Yes vs. No	-0.328	0.090	-3.663	0.000	0.72	0.60	0.86
Criminal History Category							
CHC II vs. CHC I	0.336	0.142	2.374	0.018	1.40	1.06	1.85
CHC III vs. CHC I	0.789	0.130	6.087	0.000	2.20	1.71	2.84
CHC IV vs. CHC I	1.065	0.158	6.744	0.000	2.90	2.13	3.96
CHC V vs. CHC I	1.516	0.216	7.016	0.000	4.55	3.00	7.02
CHC VI vs. CHC I	1.752	0.145	12.098	0.000	5.77	4.35	7.68
Guideline							
§2K2.1 vs. §2D1.1	0.852	0.225	3.787	0.000	2.34	1.52	3.69
§2B3.1 vs. §2D1.1	0.503	0.349	1.441	0.149	1.65	0.83	3.27
Other vs. §2D1.1	-0.140	0.483	-0.290	0.772	0.87	0.32	2.19
Violence							
Yes vs. No	0.125	0.310	0.404	0.686	1.13	0.62	2.10
Weapons Adjustment							
Yes vs. No	-0.054	0.106	-0.510	0.610	0.95	0.77	1.17
Substantial Assistance							
Yes vs. No	-0.092	0.115	-0.798	0.425	0.91	0.73	1.14
Safety Valve							
Yes vs. No	0.277	0.259	1.067	0.286	1.32	0.79	2.18
-2 Log Likelihood		-1724.626 (df = 19)					
McFadden Pseudo R^2		0.14					
N		2,630					

Response Variable: recidivism (rearrest)

ENDNOTES

1 *See* U.S. Sentencing Comm'n, Supplementary Report On The Initial Sentencing Guidelines And Policy Statements 41–44 (1987), http://www.ussc.gov/sites/default/files/pdf/guidelines-manual/1987/manual-pdf/1987_Supplementary_Report_Initial_Sentencing_Guidelines.pdf; U.S. Sentencing Comm'n, Recidivism Among Offenders Receiving Retroactive Sentence Reductions: The 2007 Crack Cocaine Amendment (2014), https:www.ussc.gov/sites/default/files/pdf/research-and-publications/research-projects-and-surveys/miscellaneous/20140527_Recidivism_2007_Crack_Cocaine_Amendment.pdf; U.S. Sentencing Comm'n, Report to Congress: Federal Child Pornography Offenses 293–310 (2012), https://www.ussc.gov/sites/default/files/pdf/news/congressional-testimony-and-reports/sex-offense-topics/201212-federal-child-pornography-offenses/Full_Report_to_Congress.pdf; U.S. Sentencing Comm'n, A Comparison Of The Federal Sentencing Guidelines Criminal History Category And The U.S. Parole Commission Salient Factor Score (2005), http://www.ussc.gov/sites/default/files/pdf/research-and-publications/research-publications/2005/20050104_Recidivism_Salient_Factor_Computation.pdf; U.S. Sentencing Comm'n, Recidivism And The "First Offender" (2004), https://www.ussc.gov/sites/default/files/pdf/research-and-publications/research-publications/2004/200405_Recidivism_First_Offender.pdf; U.S. Sentencing Comm'n, Measuring Recidivism: The Criminal History Computation Of The Federal Sentencing Guidelines (2004), https://www.ussc.gov/sites/default/files/pdf/research-and-publications/research-publications/2004/200405_Recidivism_Criminal_History.pdf.

2 18 U.S.C. § 3553(a)(2)(C).

3 28 U.S.C. § 991(b)(1)(C).

4 U.S. Sentencing Comm'n, Recidivism Among Federal Offenders: A Comprehensive Overview (2016), https://www.ussc.gov/sites/default/files/pdf/research-and-publications/research-publications/2016/recidivism_overview.pdf [hereinafter Recidivism Overview Report].

5 U.S. Sentencing Comm'n, The Past Predicts The Future: Criminal History and Recidivism of Federal Offenders (2017), https://www.ussc.gov/sites/default/files/pdf/research-and-publications/research-publications/2017/20170309_Recidivism-CH.pdf [hereinafter Criminal History Report].

6 U.S. Sentencing Comm'n, The Effects of Aging on Recidivism Among Federal Offenders (2017), https://www.ussc.gov/sites/default/files/pdf/research-and-publications/research-publications/2017/20171207_Recidivism-Age.pdf [hereinafter Age and Recidivism Report].

7 U.S. Sentencing Comm'n, Recidivism Among Federal Drug Trafficking Offenders (2017), https://www.ussc.gov/sites/default/files/pdf/research-and-publications/research-publications/2017/20170221_Recidivism-Drugs.pdf [hereinafter Drug Trafficking and Recidivism Report]; U.S. Sentencing Comm'n, Recidivism Among Federal Violent Offenders (2019), https://www.ussc.gov/sites/default/files/pdf/research-and-publications/research-publications/2019/20190124_Recidivism_Violence.pdf [hereinafter Violence Report]; U.S. Sentencing Comm'n, Recidivism Among Federal Firearms Offenders (2019), https://www.ussc.gov/sites/default/files/pdf/research-and-publications/research-publications/2019/20190627_Recidivism_Firearms.pdf [hereinafter Firearms Report].

8 *See* Recidivism Overview Report, *supra* note 4, at 22.

9 *See* Drug Trafficking and Recidivism Report, *supra* note 7, at 18.

10 While various statistical models may predict either a deterrent or criminogenic relationship between length of incarceration and recidivism, those relationships may not be statistically significant. Statistical significance indicates that the relationship observed, deterrent, or criminogenic, is unlikely to be a false positive (*i.e.*, indicating there is a relationship when, in fact, there is not). Statistical significance is important in that it provides a degree of certainty that an observed relationship is, in fact, not a false positive. Thus, it is possible that no statistically significant relationship between length of incarceration and recidivism is identified.

11 *See* Daniel S. Nagin et al., *Imprisonment and Reoffending*, 38 Crime & Just. 115, 121 (2009).

12 *See* Dorothy R. Jaman et al., *Parole Outcome as a Function of Time Served*, 12 Brit. J. Of Criminology 5 (1972); Elizabeth Deschenes et al., Intensive Community Supervision In Minnesota: A Dual Experiment In Prison Diversion And Enhanced Supervised Release (1995); Thomas A. Loughran et al., *Estimating a Dose-Response Relationship Between Length of Stay and Future Recidivism in Serious Juvenile Offenders*, 47 Criminology 699 (2009); Benjamin Meade et al., *Estimating a Dose-Response Relationship Between Time Served in Prison and Recidivism*, 50 J. Res. Crime & Delinq. 525 (2013).

13 Nagin et al., *supra* note 11, at 169, in the majority of regression studies examining length of incarceration and recidivism, time served was included as a control variable, rather than explanatory variable, in the study.

14 Nagin and his colleagues note that in in many nonexperimental studies, insufficient control for the relationship between age and reoffending rates could substantially bias estimates and therefore are insufficient for use in public policy. *Id*. at 121, 175.

15 Meade et al., *supra* note 12.

16 *Id*.

17 Nagin et al., *supra* note 11, at 121 concludes, "existing research [on the impact of imprisonment and subsequent recidivism] is not nearly sufficient for making firm evidence-based conclusions for either science or public policy."

18 *See* U.S. Dept. of Justice, Nat'l Inst. Of Justice, Recidivism, https://web.archive.org/web/20160120175242/http://www.nij.gov/topics/corrections/recidivism/pages/welcome.aspx (Jan. 20, 2016); Michael D. Maltz, Recidivism 1, 54 (2001). According to Maltz, "recidivism, in a criminal justice context, can be defined as the reversion of an individual to criminal behavior after he or she has been convicted of a prior offense, sentenced, and (presumably) corrected". Recidivism is derived from the Latin *recidere*, to fall back, representing an individual who, after release from custody for having committed a crime, is not rehabilitated and, instead, relapses into former criminal behavior patterns.

19 Maltz, *supra* note 18, at 7–20; *see also* Ryan King & Brian Elderboom, Improving Recidivism as a Performance Measure, Urban Inst. (2014), https://www.bja.gov/Publications/UI-ImprovingRecidivism.pdf.

20 *See* Christopher T. Lowenkamp et al., Investigating The Impact Of Pretrial Detention On Sentencing Outcomes (2013), https://craftmediabucket.s3.amazonaws.com/uploads/PDFs/LJAF_Report_state-sentencing_FNL.pdf.

21 Maltz, *supra* note 18 ("[R]ecidivism is measured by criminal acts that resulted in rearrest, reconviction or return to prison."); *See also* U.S. Dept. of Justice, Nat'l Inst. Of Justice, Measuring Recidivism, https://web.archive.org/web/20160129195540/http://www.nij.gov/topics/corrections/recidivism/pages/measuring.aspx (Jan. 29, 2016).

22 *See* Maltz, *supra* note 18, at 60.

23 Arrests for alleged violations of probation, supervised release, or state parole (as well as actual revocations of any of these types of supervision) were counted as rearrests.

24 *See, e.g.*, 18 U.S.C. § 924(c)(1)(A)(i) (providing a five year mandatory minimum for offenders convicted of using or carrying a firearm during and in relation to, or possessing a firearm in furtherance of, a crime of violence or drug trafficking crime); 18 U.S.C. § 2252(b)(1) (providing a five year mandatory minimum for offenders convicted of receipt, distribution, and possession with the intent to distribute or sell child pornography); U.S. Sentencing Comm'n, An Overview of Mandatory Minimum Penalties in the Federal Criminal Justice System (2017), https://www.ussc.gov/sites/default/files/pdf/research-and-publications/research-publications/2017/20170711_Mand-Min.pdf.

25 This two-stage process of creating comparison groups and then utilizing regression modeling results in a doubly robust estimation. Doubly robust estimation is particularly powerful in that only one of the two models needs to be correctly specified to obtain unbiased estimates. *See* Michele Jonsson Funk et al., *Doubly Robust Estimation of Causal Effects*, 7 Am. J. Epidemiology 761–767 (2011).

26 *See* Michele Jonsson Funk et al., Doubly Robust Estimation of Causal Effects, 7 Am. J. Epidemiology 761 (2011).

27 The level of precision in matches can be specified by the researcher through a distance caliper. The distance caliper acts as a threshold defining the degree of matching precision.

28 Weights were created using a logistic link function with linear propensity score.

29 *See* Meade et al., *supra* note 12. In some studies, the researchers first matched all offenders on certain characteristics and then second identified various study groups based on length of incarceration. While this design creates study groups that balance on matched characteristics, it does not preserve the natural composition of offenders serving various lengths of incarceration. The Commission chose to first identify study groups and second create matched comparison groups to preserve the natural composition of offenders sentenced to various lengths of incarceration.

30 Nagin et al., *supra* note 11, at 142, identified five principal attributes that studies examining length of incarceration and recidivism must address: age, sex, race, instant offense type, and prior criminal history.

31 *See* Age and Recidivism Report, *supra* note 6, at 3; Recidivism Overview Report, *supra* note 4, at A-1.

32 *See* Recidivism Overview Report, *supra* note 4, at A-1.

33 *See* Criminal History Report, *supra* note 5; Recidivism Overview Report, *supra* note 4, at A-1.

34 *See* Recidivism Overview Report, *supra* note 4, at A-1.

35 *See* Recidivism Overview Report, *supra* note 4, at A-1.

36 *See* Violence Report, *supra* note 7, at 3.

37 *See* Firearms Report, *supra* note 7, at 4; Recidivism Overview Report, *supra* note 4, at A-1.

38 Research design one used non-bipartite distance matching with Mahalanobis Distances as the distance metric. By utilizing an extremely small distance caliper, 0.1, age-at-release was the only attribute that could vary, and it was restricted to vary by only one year. Offender age is highly correlated with recidivism and, therefore, it is important that offenders being compared do not have large differences in age-at-release. By only allowing age-at-release to vary by one year, this study controls for any potential effects age might have on recidivism rates.

39 The threshold for weighting balance was 0.1 standardized mean differences. This means the study and comparison groups could not have a standardized mean difference greater than 0.1 after weighting. While there is no universally agreed upon convention regarding what threshold indicates substantial imbalance between groups, a standardized mean difference greater than 0.1 has been suggested to indicate difference between groups. *See* Peter C. Austin, *An Introduction to Propensity Score Methods for Reducing the Effects of Confounding in Observational Studies*, 46 Multivariate Behav. Res. 399 (2011).

40 *See* Federal Judicial Center, Reference Manual on Scientific Evidence 303 (2011) (Reference Guide on Multiple Regression) for an overview of regression modeling.

41 Appendix A provides odds ratios for each research model.

42 For the full regression models, including estimates for all study cohorts, see Appendix B.

43 The average time to rearrest was not statistically significantly different. Welch's two sample t-test was used to test for statistical significance; $t = -0.15$, $df = 145$, $p = 0.88$.

44 As noted in Research Design 1B, the 36 month maximum difference restriction was excluded. This exclusion did not affect the first study group, offenders sentenced to more than 24 months up to 36 months, because this study group was already naturally bound to offenders with a maximum sentence difference of 36 months (*i.e.*, for study group one, the maximum possible sentence is 36 months and the lowest possible sentence is one day).

45 For the full regression models, including estimates for all study cohorts, see Appendix C.

46 The average time to rearrest was not statistically significantly different. Welch's two sample t-test was used to test for statistical significance; $t = -0.21$, $df = 1180$, $p = 0.83$.

47 The average time to rearrest was not statistically significantly different. A Welch's two sample t-test was used to test for statistical significance; $t = -1.71$, $df = 1930$, $p = 0.09$.

48 For each of the study cohorts, balance was achieved between the study and comparison groups, with a maximum standardized mean difference of 0.1.

49 For the full regression models, including estimates for all study cohorts, see Appendix D.

50 The average time to rearrest was not statistically significantly different. Welch's two sample t-test was used to test for statistical significance; $t = -0.13$, $df = 1398$, $p = 0.89$.

51 The average time to rearrest was statistically significantly different. Welch's two sample t-test was used to test for statistical significance; $t = -2.11$, $df = 2485$, $p = 0.04$.

52 *See* Appendix A, Table A-2, for the odds ratios for each study level across the three models.

53 Research Design 1B estimated 30% less likely to recidivate; Research Design 2 estimated 29% less likely to recidivate.

54 Research Design 1B estimated 16% less likely to recidivate; Research Design 2 estimated 18% less likely to recidivate.