National Corrections Reporting Program (NCRP) White Paper Series

White Paper # 1: Observations on the NCRP

Revised, September 4, 2012

Prepared by:
William Rhodes, Principal Investigator
Gerald Gaes, Principal Investigator
Tom Rich, Project Director
Yuli Almozlino
Mica Astion
Ryan Kling
Jeremy Luallen
Kevin Neary
Michael Shively

Abt Associates Inc.
55 Wheeler Street
Cambridge, MA 02138

This project was supported by Grant No. 2010-BJ-CX-K067 awarded by the Bureau of Justice Statistics, Office of Justice Programs, U.S. Department of Justice. Points of view in this document are those of the author and do not necessarily represent the official position of the U.S. Department of Justice.

In collaboration with the Bureau of Justice Statistics (BJS), the Abt Associates team has reoriented the National Corrections Reporting Program (NCRP). The reorientation is consistent with earlier decisions by BJS to improve the quality of NCRP data by closely examining the relationships between admission and release records. This white paper is one in a series of white papers produced by Abt Associates for the NCRP project. Although this work is still in progress, this white paper reviews where we have been, where we are, and where we are going.

Abt Associates replaced the Census Bureau as the NCRP contractor in the Fall of 2010. To clarify the differences between the prior and current efforts, it is convenient to call the BJS/Census NCRP the *old-NCRP* and to call the BJS/Abt NCRP the *new-NCRP*. The two are different both in goals and approach.

The Old-NCRP and the New-NCRP

The old-NCRP was a year-by-year accounting of prison admissions and prison releases (flows) and year-end prison stocks. We use the terms census and stock interchangeably to mean the number of prisoners under the custody of a jurisdiction at the end of the year. The new-NCRP is best seen as a **continuous time-series of admissions and releases** starting with the first year that a state reported admission, prison release, and year-end census data and ending with the current reporting year. In the new-NCRP, the stock can be derived at any point in time.

The old-NCRP was an ambitious accounting system whose quality could be judged by the validity and reliability of its annual counts of flows and stocks. The new-NCRP is an **analysis system** whose quality can be judged by the validity and reliability of inferences based on the NCRP data.[1]

The old-NCRP was based on a complex set of accounting rules. Given the complexity of those rules, the old-NCRP lacked transparency. Summary tables produced from the NCRP data were difficult to interpret because a reader could not know how assumptions affected interpretations. The new-NCRP seeks to employ a **simple and universal set of rules** for analysis and assembly of meaningful data, and it seeks to provide quantitative guidance for interpreting tables.

The new-NCRP is being built with **policy questions as motivation**. Abt Associates is working collaboratively with BJS to identify relevant policy questions. The old-NCRP was built with data assembly as motivation. It is certainly true that the old-NCRP was concerned with policy issues, and researchers have answered important policy question using the old-NCRP data. However, old-NCRP data were not collected, and the resulting analysis files were not assembled, with specific policy questions as part of the NCRP design.

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[1] An illustration may be helpful. States occasionally report an admission followed by a release that is followed by still another release. Working as accountants, data assemblers could work with the states to reconcile every such ambiguity, but this is a laborious process that can pose undue burden on the state. Working as analysts, an alternative approach is for data assemblers to adopt a rule that would either drop the intervening release record or insert the missing admission record. The rule would sometimes make mistakes, but it would nevertheless lead to justifiable approximations for admissions, releases and stocks and remove a burden from the states. Much of this memo discusses the rules and their justifications.

The differences seem subtle, but can be profound. By constructing the data as a time-series of admissions and releases, we can check internal and external consistency: Admissions must be consistent with releases; the combination of admissions and releases must be consistent with stocks. A battery of diagnostic tests, not available in the old-NCRP, has allowed the Abt team to identify and correct problems that were undiagnosed in the old-NCRP. Therefore, the new-NCRP has higher validity and reliability than the old-NCRP.

Furthermore, the new-NCRP has greater utility than the old-NCRP. Rather than consider an admission or release as an event occurring sometime in a specific calendar year, a time-series approach affords an assessment of trends over time, allowing the analysts to examine interruptions or unusual events in the time series. A time-series approach also takes into account the incarceration, release, and repeated incarceration of the same inmate over an extended period of time, allowing an analyst to ask questions about the frequency and total period of incarceration for specific inmates. The new-NCRP answers a broader set of policy questions than did the old-NCRP. For example, how long does it take for a policy change that affects sentencing within a state to affect observed changes in the admission, release, or stock population?

One of the motivations for reorienting NCRP is to make it a more useful data set for state use. Under the old-NCRP, there had been a progressive decline in NCRP participation, and the new-NCRP seeks to reverse that decline and extend reporting to all states. The more useful that states find the new-NCRP, the more likely they will submit data and respond to Abt inquiries about data integrity and unusual trends in the data. BJS's goals for a national corrections statistics system is served by developing data that have value for the state contributors, while implementing reporting procedures that impose the least burden on the states.

The New-NCRP

To describe the new-NCRP, we introduce some new concepts. Throughout this document, we discuss the manipulation of prison admission (A record), prison release (B record), and census (D record) records. The explanation also uses the concepts: observation window, sequences, terms and histories.

Observation window	The observation window begins on December 31 of the first year for which we have D records and it ends on December 31 of the last year for which we have D records. Note that the new-NCRP drops admission and release records that appeared in the old-NCRP when the old-NCRP covered years for which there are no D records. As explained in this white paper, the D records are necessary for diagnostic testing, which cannot occur for years that predate the beginning of reporting D records.
Sequences	A sequence is the observed order of A and B records. The shorthand A → B indicates that an offender entered prison on the admission date reported in the A records and he exited prison on the release date reported in the B record. Sequences are sometimes more complicated than A → B.

Terms	Offenders serve prison terms defined by when they entered prison (recorded on an A record) and when they exited prison (recorded on a B record). A term is defined by an unambiguous A → B sequence. Ambiguous sequences include …A → A → B and A → B → B…, where the ellipses allow for multiple records. Our computing algorithm uses universal rules to convert ambiguous sequences identified during the observation window into unambiguous sequences, hereafter known as terms.
Histories	Offenders may have histories of multiple terms during the observation window. The history identifies when an offender was in prison and when he was not in prison. For present purposes, *prison* means whatever form of incarceration the state is able to report to the NCRP.

The new-NCRP is composed of terms and histories. Once we have identified terms, we can discard the A, B and D records.[2] Using the term data, we can:

- Plot trends in admissions and releases throughout the observation window.
- Compute stocks for any point in time.
- Estimate time spent in prison on any term and across multiple terms that occur during the observation window.
- Estimate recidivism, defined as return to prison.

Having introduced a vocabulary, having provided an overview of the construction of the term records, and having provided motivation for assembling the NCRP data, this white paper now turns to the mechanical task for assembling the terms.

Constructing the Term Record

This white paper provides a high-level overview of how we construct a term record; a companion white paper provides technical details including a discussion of diagnostics. To represent term record construction procedures, we introduce more notation and an idealized way of presenting some of the sequences that are encountered in the NCRP data. There are many such possible sequences; however, we will describe a few to demonstrate how we approach the construction of the term records.

A records are now represented as A(1). The number in parentheses is the admission date. B records are represented as B(1,2) or B(1,3). The numbers in parentheses are the admission date followed by the release date. The sequence A(1) → B(1,2) implies that the A and B records have the same admission dates, and the release date is after the admission date. The sequence

[2] Any variables that are unique to the A, B or D record would be retained on the term record. By "discard" we mean that the terms contain all the information provided by the separate A, B and D records. BJS may make the original A, B and D records available for researchers who want to construct their own term records or who want to extend the observation window to earlier than the first date when D records appear in the NCRP. We caution against performing either task. Term records are very difficult to construct without using the tested computing algorithms developed for the new-NCRP. Also, the old-NCRP data have not gone through reliability and validity checks, which caused us to make extensive changes to the new-NCRP data.

A(1) → B(1,2) → B(1,3) implies the two release records have the same admission date, but two different release dates.

Another way of depicting how these records occur over time is to represent them in a picture showing where they are in relation to each other in a given observation window. We only represent three years in the hypothetical observation window for simplification, but many of the states have sufficient data to use an observation window extending over a decade. First we describe the construction of unambiguous term records; second, we describe the resolution of ambiguous term records.

1. Unambiguous Term Records

In Figure 1, we depict an unambiguous A → B sequence.

Figure 1.

	2003		2004		2005	
	A(1)	D(1)	B(1,2)			

Figure 1 shows that for this prisoner an admission occurred in 2003 and his release occurred in 2004. The grey-scaled column represents the last day of the calendar year, December 31. In this picture, there will be four such calendar dates, one for 2002, 2003, 2004, and 2005. In this case, because a person was admitted prior to December 31, 2003 and released prior to December 31, 2004, one D record appears in this sequence. The sequence in Figure 1 is coherent. It shows someone being admitted, released, and present on the census date when we would expect that person to be in prison. The admission date on the A record matches the admission date on the B record. We call this an unambiguous sequence.

As drawn in this hypothetical illustration, if the offender was admitted before December 31 and if he was released after December 31, then he would appear in prison on December 31. In reality the appearance in prison after the admission date and before the release date is not certain, because offenders are sometimes on temporary leave. To deal with this situation, we define a statistic P, which is the probability that someone who was admitted before December 31 and who was released after December 31 would actually be in prison on December 31 (as indicated by the presence of a D record). In most prisons, P is a high number like 0.98, but it is not likely to be 1.00. As we will explain, P plays a role in resolving ambiguous sequences.

Typically terms can also be identified from A and B records when they appear alone in the time-series. Sometimes we only observe a B record, but an A record is implied, as shown in Figure 2.

Figure 2.

	2003		2004		2005	
D(1)		D(1)	B(1,2)			

For this sequence there is only a B record, so the observed sequence is →B. The admission date on this B record indicates that the admission occurred prior to the observation window. In this case, we observe a census record on December 31st for both 2002 and 2003, so the A record is implied, and in

fact can be constructed given the admission date on the B record. Thus the sequence → B can always be converted into a sequence A → B.

Sometimes we only observe an A record, so the observed pattern is A→, but a B record is implied. This is shown in Figure 3.

Figure 3.

	2003		2004		2005	
					A(1)	D(1)

The A record occurs alone when the release occurred (or will occur) later than the observation window. In figure 3, the person is admitted in 2005, shows up in the December 31, 2005 census record and will be released sometime in the future. The B record is implied so the A→B sequence can be constructed with suitable imputations.

Some terms cannot be identified from A and/or B records because the term spans the observation window: the admission occurs prior to the observation window and the release occurs after the observation window. However, missing terms can be identified, as shown in Figure 4. The person is present on December 31st for 2002, 2003, 2004, and 2005. The person was admitted prior to the observation window and released after the observation. The D records contain admission date, so using the D records, we can construct the A→B term.

Figure 4.

	2003		2004		2005	
D(1)		D(1)		D(1)		D(1)

In summary, each of the following sequences, which collectively predominate in the NCRP data, lead to unambiguous A → B terms:

- A → B
- A → …
- … → B
- … D …

There are some complications. For one, the algorithm requires correct, unique inmate identification numbers. This is usually no problem, and we have developed accurate imputation methods (based on name, sex, race and date of birth) to assign unique identification numbers where necessary. For another, admission dates sometimes change over a sequence of D records (such as the sequence shown in Figure 4), so imputing an admission date for the missing A record for the … D … sequence is uncertain. Finally, we have had to develop special computing routines for the few states that cannot report D records or that can only report D records. These and other details appear in a separate technical white paper. Having discussed the handling of the unambiguous terms, we next turn to a discussion of the ambiguous terms.

2. Ambiguous Term Records

All of the sequences we have described to this point are unambiguous constructions of A → B terms. It would be nice if all the A, B, and D records could be assembled into such terms, and most can. However, some ambiguous patterns arise. We describe the dominant ambiguous patterns in the next section. Corrections to the ambiguous patterns are performed on a state-by-state basis using a common algorithm. The ambiguous patterns take two forms with many variations.

One form is A(1) → B(1,2) → B(?,3) … The ellipses indicate that there may be more than two sequential B records. The question mark indicates that the second release record may or may not have the same admission date as the A record. Another form is … A(1) → A(2) → B(?,3) where the ellipses indicate that there may be multiple A records, and the question mark indicates that the admission date may refer to date 1 or date 2. A variation is … A → A → B → B …

After a great deal of testing, we concluded that A(1) → B(1,2) → B(?,3) … should be converted to A(1) → B(1,K) where K is the last release date observed in the sequence, which may be after the observation window when B(1,K) is implied by a D record. We concluded that … A(1) → A(2) → B(?,3) should be converted to A(J) → B(J,3) where J is the admission date for the first admission record, which may be before the observation window, then A(J) is implied by a D record.

There are two arguments for this decision, one logical and the other empirical. Logically there is a reason to expect such records. When an offender serves concurrent long and short sentences, it seems reasonable to expect A(1) → B(1,2) → B(1,3) where the first B record records the end of the short sentence and the second B record records the end of the long sentence. Both sentences began on the same date. When an offender serves consecutive sentences, it seems reasonable to expect A(1) → B(1,2) → B(2,3). An alternative explanation is that an offender receives a new sentence during his term, and the state has some convention of reporting multiple A or B records to capture those changes. It is impractical to identify which event caused the observed pattern, but converting the ambiguous sequences to A → B makes sense because the offender does not leave prison.

The empirical argument comes from examining P, the statistic identified earlier as the probability that the offender would be in prison given that an A and B record bracket the expected D record. Consider the sequence A → B → B. If the offender was not actually released after the first B record, we would expect to observe an intervening D record: A → B → D → B. In fact this is typically the case; the observed value of P is close to the P when the A → B sequence is unambiguous. Suppose that the offender was actually released, recidivated, but the A record was missing from the real sequence A(1) → B(1,2) A(3) → B(3,4). Depending on when A(3) occurs we will either see a D record (if the second admission is before December 31) or we will not see a D record (if the first release is before December 31 and the second admission is after December 31). Although a more reasoned mathematical argument is that the observed values for P should be much lower than 0.5, intuition suggests that P should surely be no larger than 0.5 if the offender had actually been released, while in fact we observe much larger values of P. The implication is that offenders were not really released until the end of the sequence A → B → B.

Hence, our approach was to retain the first A record and the last B record to convert the ambiguous cases into unambiguous A → B sequences. Two discussion points are pertinent.

What if we are wrong? In fact there may be missing A and B records, and the imputations may ignore them. The consequence is to make some prison terms appear longer than they are in fact, and make rates of recidivism smaller than they are in fact. We doubt that this is a serious bias, because most sequences are unambiguous, and for the ambiguous sequences, most of those A(1) → B(1,2) → B(?,3) patterns are correctly reconstructed as A(1) → B(1,3) according to the diagnostics based on P.

The entire problem is likely to be temporary. Currently the C records (parole release records) are unreliable because they do not capture all forms of post-prison community supervision, and they are not especially useful because they only report community supervision terms when the terms end and they do not contain the date the community supervision term began. We are currently seeking to acquire community supervision terms when they begin, so that community supervision records would have counterparts to the A and B records. This would allow us to determine if a community supervision term (parole or other form of community supervision) actually occurred within the ambiguous sequence A → B → B. If so, then we would know that the sequence should be revised to A → B A →B, with a term of community supervision between the first B and the second A record. If not, then we would know for sure that the sequence should be revised to A → B. In short, we have adopted what appear to be the most reasonable rules for resolving the ambiguous sequences, and we expect to improve the rules for resolving ambiguities in the future.

An Analysis File

In the old-NCRP, the analysis file comprised A (admission), B (Release), C (Parole), and D (Census) records reported on a year-by-year basis. The old-NCRP was cumbersome for several reasons. Because the A, B, C and D files were not linked, there was no simple way to test for consistency across the records. In fact, based on the A→B analysis reported above, we know that raw A, B, C and D records were occasionally inconsistent. Also, because the A, B, C and D records were reported on a year-by-year basis, there was no simple way to construct a time-series. In fact, based on the A→B analysis, we know that the assembly of a time-series is complicated.

In contrast, the new-NCRP resolves inconsistencies across the A,B and D records, combines the A, B and D records into a single record (the term record), and replaces the year-by-year files with a single analysis file spanning the observation window. *Although the new-NCRP has collapsed a cumbersome file structure into a single file, no information is lost.* With a few lines of computing code, an analyst can assemble all A and B records for whatever span of time is desired, including a given year. With a few lines of computing code, an analyst can assemble the D records for any day and year, including December 31 if desired.

Having constructed the term and history records, we can anticipate answering some useful research questions:

- What is the composition of the prison population by race/ethnicity, gender, age, offenses, etc.?
- What proportion of the time-series do offenders spend in prison?
- What are trends in admissions, releases and stocks for the entire population and for subpopulations?

- What is the rate of recidivism defined as a return to prison in the same state?

These questions can be answered with a relatively simple analysis file that uses a universal and transparent set of rules to assemble the NCRP records. The analysis file does not have to be perfectly accurate to answer the questions. For example, there may be occasional ambiguities regarding the exact date of release from prison, but provided these dates are not in gross error, there is little impact on estimates of time-served and trends in recidivism. When gross discrepancies arise, they can be discounted, either by excluding the case from the data or otherwise trimming responses (say by establishing a maximum time-served and setting observed time-served to the maximum when the observed time-served exceeds the maximum). The data may be wrong for that case, but these occasional errors will have no important effect on estimates of means, medians standard deviations and other statistics.

We can anticipate some additional research questions:

- What proportion of a sentence is served in prison?
- What proportion of prison admissions are for violations of community supervision?

These are important questions, but they are not answerable with these data. The first is not directly answerable because many states do not report jail terms and because the NCRP does not reliably report credit for time served. The question in the second bullet is not directly answerable because: (1) states do not report admission codes reliably, or (2) a revocation results in a new sentence so revocations are coded as new admissions, or (3) whether an offender is revoked or convicted of a new crime is a prosecutorial policy choice. Although these are important policy questions, we would argue that project resources should not go to attempting to fix problems that are not fixable.

Imputations

The analysis file can benefit from imputations. At least two applications deserve some attention. The first is that some variables (age, gender, etc.) may be missing at random. This is a traditional problem. It may be possible to borrow data from terms with full data to impute data for terms with missing data for terms that are part of the same history. Or, we might apply more sophisticated imputation procedures based on Bayesian logic. This is computer intensive so we will have to judge if the effort is worth the resulting product.

Second, it may be useful to impute release dates for B records that will occur sometime in the future. This is unnecessary for answering most questions, but BJS has expressed an interest in modeling projections. Modeling projections places two demands on the analysis. The first is to project release dates for offenders who are already part of the stock. The second is to project prison terms for offenders who will be admitted in the future. Satisfying the first demand is relatively easy although it is sensitive to unanticipated policy shifts. Satisfying the second is much more difficult, especially since many prison systems appear to be at a turning point in their population growth showing a decline in admissions. Projecting new admissions will require outside data, such as arrests and state budget obligations, and assumptions of stable relationships between those outside data and admissions.

Quality Control

The old-NCRP had few quality control measures beyond range checks. For example, we discovered that two apparent years of D records were from the same year in one state, but old-NCRP quality checks were unable to detect this gross problem. The new-NCRP has introduced quality checks linked with corrective actions. We provide an overview.

1. The Fact Sheets

Abt has developed sentencing and corrections fact sheets for every state. These are updated periodically and reviewed by state authorities for accuracy. Each fact sheet contains jurisdiction specific information on factors that determine time served such as: whether the jurisdiction has a determinate or indeterminate sentencing structure; good time credits and other policies that affect time served; habitual offender laws; mandatory minimum provisions; and whether the state has sentencing guidelines. The fact sheets portray facility information including how states use jails versus prison to incarcerate sentenced offenders. Information is also gathered on whether states use private prisons to house inmates either within their jurisdiction or in another jurisdiction. The fact sheets also contain information on post-release supervision including the types of supervision and the agencies responsible for that oversight.

The fact sheets introduce two purposes. The first is that they define the boundaries of the prison populations. The most important boundary is the criterion for prison eligibility – typically, sentences over one year but sometimes the criterion is different. Without the fact sheets there would be no way to make cross-sectional comparisons because states differ regarding prison eligibility. The fact sheets also often explain disruptions in time-series. For example, states that change their laws or policy governing sentencing, good time credits, and release of prisoners are identified by fact sheets, providing explanations for observed changes in trends.

2. External Reliability Checks

Unless differences between the D census records and other sources can be reconciled, there is little reason to go any further with the NCRP data, because the process of identifying terms depends on the D records being correct. Our basic approach is to reconcile statistics based on the D records with statistics published by the states. We also use external data to reconcile admissions and releases. When there are discrepancies, our state liaisons ask for an explanation, which often leads to a revised request for data. In some states, correcting errors has meant replacing entire years of old-NCRP data, and in some states is has meant replacing the old-NCRP data for the entire observation window.

3. Internal Reliability Checks

We have built some internal validity checks into data processing. These are not glamorous but they are essential. Range checks are an illustration; interrupted trends are another.

4. Building the Terms

So far we have described the process of building terms as a final step in building the analysis file, but the process of building the analysis file employs a battery of diagnostic testing too detailed to provide a complete description here. We limit the discussion to gross diagnostics.

The analysis file is term-based. Because we know when every term started and ended, we can use the terms to reconstruct populations at any point in time, including December 31 of every year. This is a basic diagnostic. If we cannot reconstruct the prison populations with acceptable accuracy, the analysis file fails to pass a basic diagnostic test.

Furthermore, the analysis file should pass a smoothness test. That is, there should be gradual changes in admissions and releases. There may be interruptions to the trends corresponding to changes in admission practices, changes in release practices, or changes in the use of private prisons/out-of-state prison use. The point is that any break in a trend should have an explanation in the fact sheet, else it is an indicator of a data problem, again motivating our state liaisons to contact the state for an explanation.

In fact the diagnostics have become sophisticated and very useful. The diagnostics that are based on the A→B logic have allowed us to detect problems that were not uncovered by the old-NCRP program. For example, as noted earlier, we found instances where the states reported the "same" census data for two different years. This was difficult to detect because the "same" census data differed slightly apparently due to data corrections made by the state agency. Nevertheless, these was a gross discrepancy between the A → B sequences and the D data for that year. As another example, we discovered an instance where the state changed how it reported offender identification codes. This problem was not apparent when looking at individual years; it only became apparent when looking at the diagnostics.

5. Summary

The NCRP is reliant on the accuracy of state reporting systems but the problem with the NCRP is not so much that the states maintain low quality data, but rather, the problem is in acquiring the correct state data and assembling it into records that are meaningful for statistical analysis. Many problems are transmission problems, e.g. the state sends the wrong data or data are partial for reasons that are undocumented. Provided the bad transmission can be detected, our experience is that the state can send an amended file. Other problems are due to states having outdated offender information systems that have limited storage capacity, such as the ability to only maintain an offender's most recent admission date. Many other problems are errors in interpretation. These errors can be reduced or event eliminated by understanding state correctional practices, and this has required changing the NCRP from a pure data collection activity to a data collection activity with interpretation based on knowledge of state practices.

Summary and Prospectus

We have made great strides improving the NCRP. Most states now contribute, many of them sending retrospective data so that we can reconstruct trends for even those states that never previously contributed to the NCRP program. For those states that have continuously reported to the NCRP, we have as necessary made changes to the data. The NCRP now does a good job of reflecting trends and stocks for prison populations.