

# The Differential Effect of Industries and Vocational Training on Postrelease Outcomes for Ethnic and Racial Groups: Research Note

William G. Saylor and Gerald G. Gaes

*The Post Release Employment Project was designed to evaluate the effect of industrial work experience (ie, UNICOR<sup>1</sup>), vocational, and apprenticeship training programs on prison adjustment and postrelease outcomes. Postrelease outcomes were defined as employment and recidivism. Short-term recidivism—up to 1 year—was based on either a revocation of a term of supervision or rearrest. Long-term recidivism—up to 12 years—was defined as a revocation or reincarceration following a conviction for a new offense. Previous findings (Saylor & Gaes, 1997) demonstrated that these kinds of programs inhibit prison misconduct, increase the likelihood of postrelease employment, and reduce postprison rearrest and recommitment rates.*

*Key words: job training program, postrelease outcomes, program evaluation, recidivism, reincarceration rates*

THE PURPOSE OF this research note is to report further analyses of the Post Release Employment Project (PREP) data, which focus on the differential effects of training programs on racial and ethnic groups. There has been some evidence that minorities may benefit more from industrial training than do nonminorities. Anderson (1995) found that 26.8 percent of black inmates who participated in penal industries in Ohio were recommitted to prison after 2 years. The percentage for a matched comparison group not participating in penal industries was 36.6. Among white inmates, the percentages were 22.3 and 23.1, respectively, for those who participated and those who did not participate in penal industries. Although these findings are suggestive, the Ohio analysis was not multivariate, nor did it use a prospective matching design. We investigate the minority group findings further in this research note by examining the relationship between training and postrelease outcomes for different racial and ethnic groups.

The PREP data set has many features that make it an important tool when addressing some of these additional applied questions about the effect of in-prison industrial and vocational training. The data set is quite large—approximately 7,000 observations—ensuring sufficient power to examine smaller effect sizes. The data were collected prospectively. The matching methodology employed sophisticated techniques to select comparison subjects. The follow-up data set includes a rich set of measures during the 1-year release period, including employment and recidivism data. The long-term follow-up period

---

*William G. Saylor, MA, is Deputy Director of Research, Office of Research and Evaluation, Federal Bureau of Prisons, Washington, DC.*

*Gerald G. Gaes, PhD, is Director of Research, Office of Research and Evaluation, Federal Bureau of Prisons, Washington, DC.*

has reached 12 years for many of the original program and comparison inmates. Very few other program evaluations have follow-up periods this long.

Based on the long-term follow-up period, Saylor and Gaes (1997) presented a model of the probability of offenders being recommitted to prison when they were members of one of three research groups: (1) those employed in federal prison industries (ie, UNICOR), (2) those who successfully completed a vocational training or apprenticeship program, or (3) those who were selected as members of a comparison group. The comparison group was composed of individuals who had neither of these program experiences but were very similar to members of the two training groups (ie, a large number of sociodemographic, educational, occupational, and criminal history characteristics). The matching procedure was based on techniques developed by Cochran and Rubin (1973) and further refined by Rosenbaum and Rubin (1984, 1985). These techniques allow the researcher to construct a comparison group to control for preexisting characteristics among individuals involved in training programs that may predispose them to perform better than members of the comparison group even in the absence of any training. In programs that use volunteers, such as the PREP study, the problem of selection bias must be addressed if we are to have any confidence in the external validity of the program effects. These techniques are explained at greater length in Saylor and Gaes (1997).

The information that follows is based on the analysis presented in Saylor and Gaes (1997). In that article, we described a Cox proportional hazards model testing the impact of training on the amount of time to a recommitment to the Bureau of Prisons. This model controls for a propensity score—a summary measure of criminal history and characteristics of the instant offense, as well as other background factors, which were used to construct the comparison group.<sup>2</sup>

*In programs that use volunteers, the problem of selection bias must be addressed if we are to have any confidence in the external validity of the program effects.*

The model also controls for the offender's age, race, ethnicity, time served, education, release year, and calendar quarter. Previous analyses showed that the impact of training on recommitment was significant for men but not for women—probably because there were too few women who actually recidivated. Thus, the data we report here are only for men.

Following procedures recommended by Allison (1995), we computed several baseline survivorship data sets that reveal the survival rate over time for particular subgroups of individuals in the PREP study. These baseline survivorship curves are conditional on the Cox proportional hazard model results and the particular values of the variables that are chosen. We graphed these results because their visual depictions clearly show the differences in survival rates. The computation and graphical depiction of these survival probabilities requires the selection of a specific segment of the individuals observed in the data, individuals who have a common set of personal characteristics that are of theoretical significance. We selected releasees who are generally believed to be a difficult group to manage in prison, and who have limited employment opportunities and a high probability of being reincarcerated after their release. The group was composed of 18–24 year old males with an education level between ninth and eleventh grades who, on average, served a 25-month sentence, and who had an average propensity score.

We computed these survival results irrespective of race and ethnicity. Subsequently, the observations were organized into four groups composed of different racial and ethnic combinations. All of the figures of these survival baseline models depict the probability of survival in the community each day subsequent to an inmate's release from the Bureau of Prisons (BOP) custody. Every figure represents three different survival rates over time. Survival rates are depicted separately for inmates who participated in industrial training (ie, UNICOR), vocational or apprenticeship training (VT), or no training (comparison/control group). The top line in each of the five figures corresponds to the VT group, the second line in each figure corresponds to the UNICOR group, and the third line in each figure corresponds to the comparison group. It is apparent that in each figure, vocational training inmates were less likely to be recommitted over time than were inmates with industrial training and that inmates participating in

prison industries were less likely to be recommitted after their release than comparison group inmates. The four numbers below the third line in each figure translate days to years and show the location in each graph that corresponds to 1, 2, 5, and 10 years after release from a BOP facility.

Figure 1 shows the survival probability for all the individuals observed in the program evaluation, irrespective of ethnicity or race. The vertical axis displays the probability of survival, which ranges from 1.00 the first day of release to about .85 at the end of the observation period; the horizontal axis displays the number of days since release from a BOP facility. The figure indicates that at day 1, on average, the probability of survival is almost 100 percent. That is, there is almost a certainty that newly released inmates were not recommitted on their first day of release. Similarly, on the last day that any of the inmates in this study were observed, the average probability that an inmate would not be reincarcerated in a federal facility was about 87 percent. Figure 1 shows that program participants performed better and had higher probabilities of survival throughout the obser-

vation period relative to the performance of comparison group members.

The subsequent four figures show the same survival probabilities over time, but each figure displays the probabilities for a different race or ethnicity combination. Figure 2 indicates the survivor probabilities for non-Hispanic, white inmates. Figure 3 represents non-Hispanic racial minorities. Figure 4 depicts Hispanic, white inmates. Finally, Figure 5 represents Hispanic racial minorities. The four figures are presented in order, from those with the most favorable survival probabilities to those with the least favorable. There are commonalities and differences in the four figures that have important implications for the development and delivery of these kinds of training programs. First, the training program group members of each race or ethnic makeup perform uniformly better than their comparison group members throughout the 8- to 12-year observation period. It is easy to observe the increasing distance between the survival probability lines as time progresses. It is also clear that the distances between the lines for program participants and those for the comparison groups are

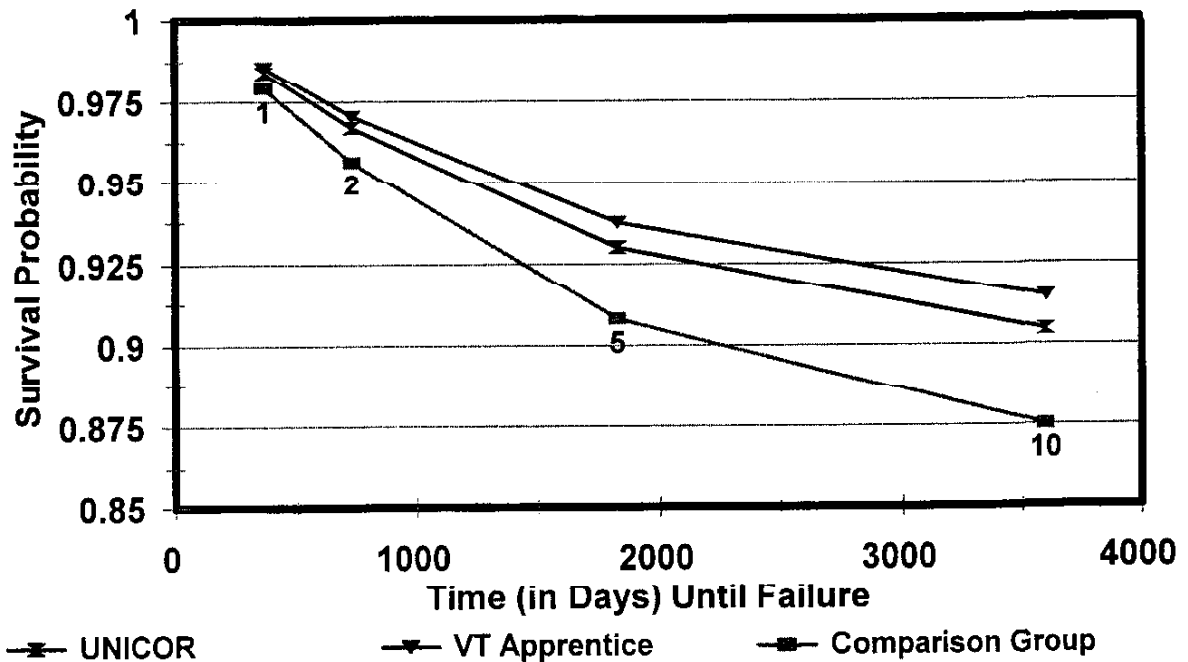


Figure 1. Survival probability by program group for all study participants.

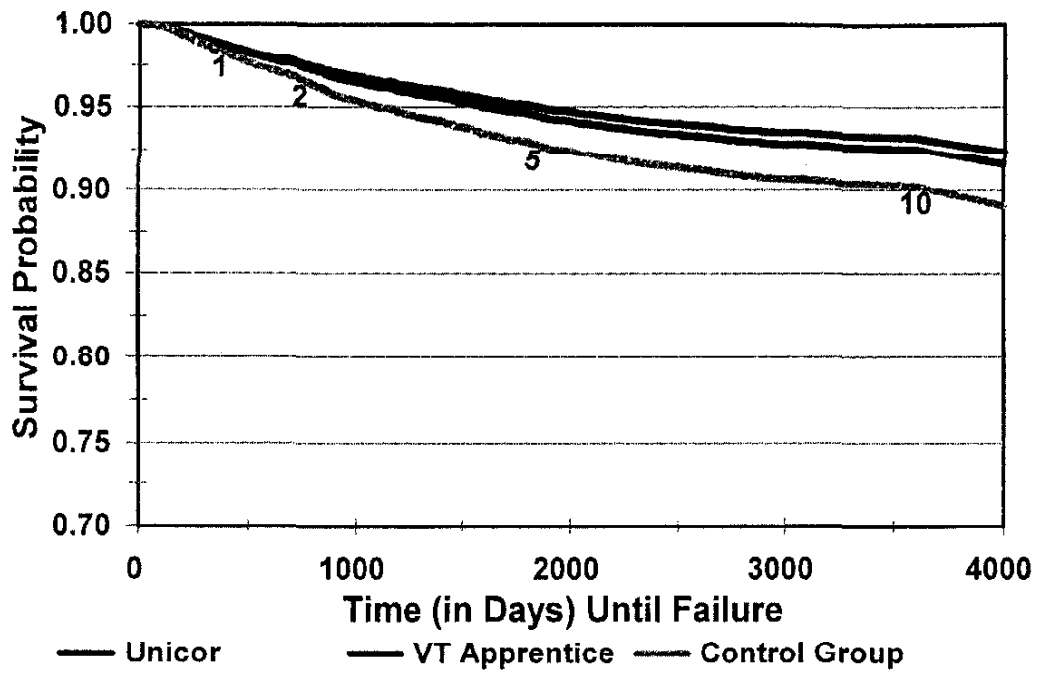


Figure 2. Survival probability for non-Hispanic whites in study.

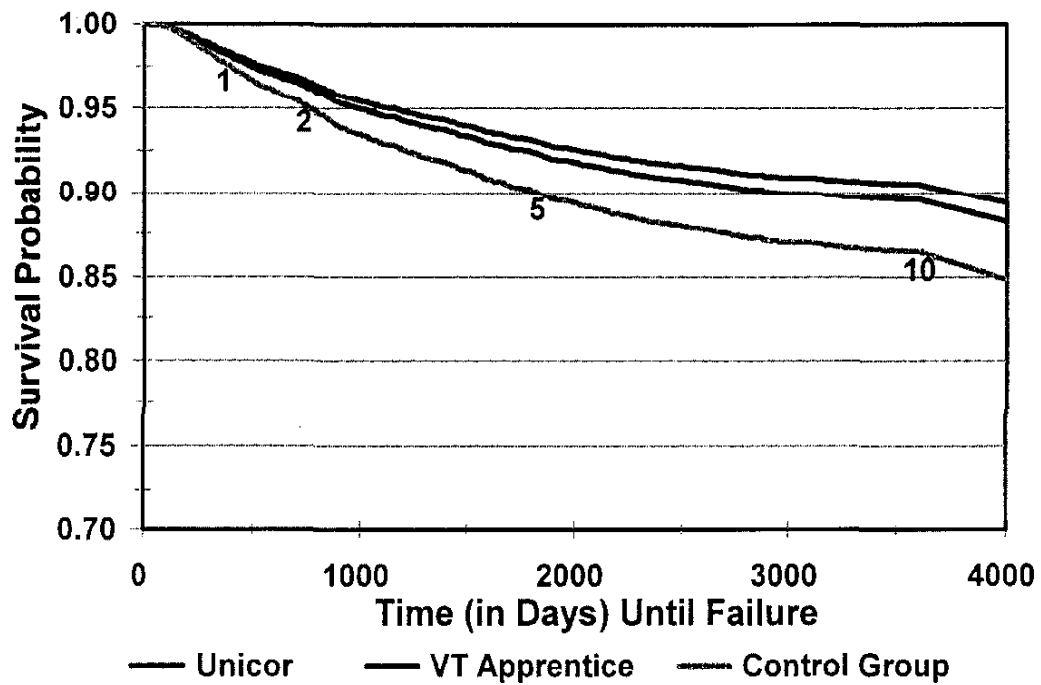


Figure 3. Survival probability for non-Hispanic racial minority in study.

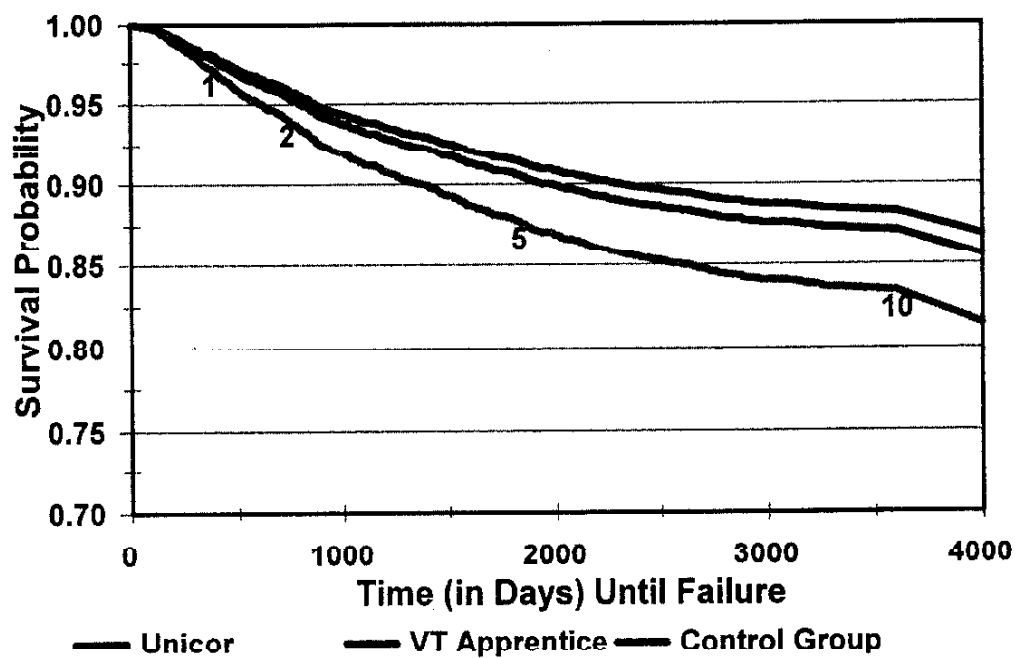


Figure 4. Survival probability for Hispanic whites in study.

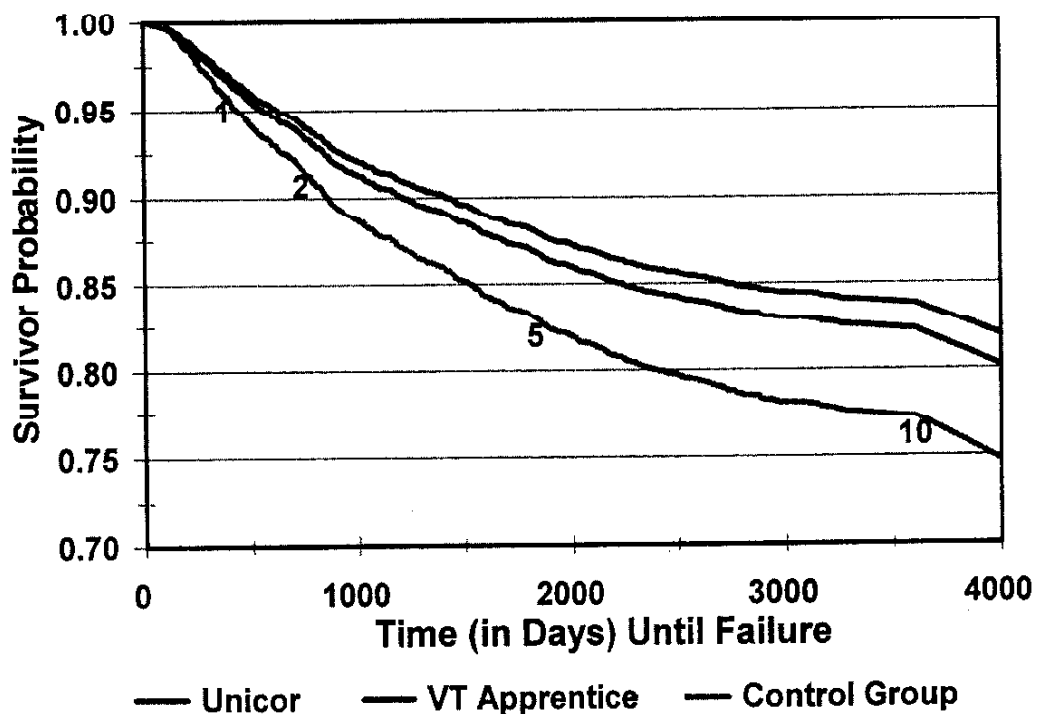


Figure 5. Survival probability for Hispanic racial minority in study.

larger for groups that are at a greater risk of recidivating. This means that the programs have a bigger impact when a group is more likely to fail over time.

But, exactly how different are the program effects for members of different racial/ethnic groups? The differential effects can be more precisely depicted by calculating the absolute and relative reductions in recidivism, or conversely the absolute and relative improvements in survival probabilities. The absolute differences are obtained by simply taking the differences in the survival rates (probabilities) between the training groups and their respective comparison groups. This provides a direct measure of the improvement in survival rates for each training program group, but the absolute measure describes only the effect within each racial group—it does not provide an efficient comparison of the program effects for each racial

and ethnic minority group relative to nonminority group program effects. To obtain an understanding of that, we calculate the relative improvement of each minority group as a percentage of the absolute improvement of white non-Hispanic inmates.

Table 1 provides the survival probabilities for each group (% survival indicates the percentage of those still surviving at the end of each of four different postrelease periods of time, which are the same percentages that appear in Figures 2 through 5), the absolute differences (% difference) in these survival probabilities between those with UNICOR or VT/apprenticeship experience and their comparisons, and the relative improvement (relative benefit) resulting from training program experience for minorities compared to non-Hispanic whites. The relative benefit column of Table 1 adjusts the absolute difference,

**Table 1**  
SURVIVAL PROBABILITIES BY RACE AND ETHNIC STATUS

	Comparison % Survival	UNICOR			Vocational Apprenticeship		
		% Survival	% Difference	Relative Benefit	% Survival	% Difference	Relative Benefit
Non-Hispanic							
White							
1 year	98.41	98.79	0.38	0.00	98.91	0.50	0.00
2 years	96.66	97.46	0.80	0.00	97.70	1.04	0.00
5 years	92.90	94.57	1.67	0.00	95.08	2.18	0.00
10 years	90.29	92.55	2.26	0.00	93.24	2.95	0.00
Non-Hispanic							
Racial Minority							
1 year	97.75	98.29	0.54	42.11	98.45	0.70	40.00
2 years	95.28	96.40	1.12	40.00	96.74	1.46	40.38
5 years	90.06	92.37	2.31	38.32	93.08	3.02	38.53
10 years	86.49	89.58	3.09	36.73	90.53	4.04	36.95
Hispanic White							
1 year	97.20	97.87	0.67	76.32	98.07	0.87	74.00
2 years	94.15	95.53	1.38	72.50	95.95	1.80	73.08
5 years	87.76	90.57	2.81	68.26	91.44	3.68	68.81
10 years	83.44	87.18	3.74	65.49	88.34	4.90	66.10
Hispanic							
Racial Minority							
1 year	96.04	96.98	0.94	147.37	97.27	1.23	146.00
2 years	91.79	93.71	1.92	140.00	94.30	2.51	141.35
5 years	83.06	86.88	3.82	128.74	88.06	5.00	129.36
10 years	77.31	82.28	4.97	119.91	83.84	6.53	121.36

or direct improvement, provided by a program (UNICOR or VT/apprenticeship), for a particular minority group as a percentage of the absolute difference for non-Hispanic, white offenders at each of the four postrelease time points. For example, non-Hispanic, racial minority inmates, who had been released for 10 years and had UNICOR experience, had a survival rate of 89.58 percent. Their comparison group had a survival rate of 86.49 percent. That yields a difference of 3.09 percentage points. The absolute difference for the comparable non-Hispanic, white group was 2.26 percent. The relative benefit for non-Hispanic racial minorities is 36.73 percent. That is, the percentage difference between non-Hispanic racial minorities and their comparisons (3.09) is 36.73 percent larger than the 2.26 percentage point improvement observed between non-Hispanic, white program participants and their comparisons. In general, the relative benefit columns show that, although the relative improvements diminish over time, the distances between the survival probability lines for the training groups and their comparison groups were between 40 and 150 percent larger for minority inmates than they were for non-Hispanic, white inmates.

## Summary and Conclusions

Our objective in this research note was to determine whether some effects of job training programs might depend on an inmate's race or ethnic makeup. Specifically, we were interested in observing whether the improvement in survival rates for program participants varied across racial and ethnic groups. To study this question we first defined a high risk of recidivism group in the absence of any consideration of their race or ethnicity. Thus, young, male, undereducated inmates recidivate at a high rate. Overlaying these characteristics, we looked to see if being in an ethnic or racial minority had an effect. Indeed, being a member of a minority also increased the risk of recidivism. Finally, we evaluated whether program participation had any differential effect on minorities compared to nonminority inmates. Regardless of whether minorities were defined on the basis of race or ethnicity, and despite their being at a higher risk of recidivism, minority groups benefited more from vocational training and industries' participation than their lower risk nonminority counter-

parts. Although the absolute differences may not appear that large, the relative improvements indicate a much larger program effect for minority program participants who are otherwise more likely to be re-committed to prison.

---

## REFERENCES

- Allison, P.D. (1995) *Survival analysis using the SAS system: A practical guide*. Cary, NC: SAS Institute Inc.
- Anderson, S.V. (1995) Evaluation of the impact of participation in Ohio penal industries on recidivism. Ohio Department of Corrections. Unpublished document.
- Cochran, W.G., & Rubin, D.B. (1973). Controlling bias in observational studies: A review. *Sankhya*, 35(4) (Series A), 417-446.
- Rosenbaum, P.R., & Rubin, D.B. (1984). Reducing bias in observational studies using subclassification on the propensity score. *Journal of the American Statistical Association*, 79(387), 516-524.
- Rosenbaum, P.R., & Rubin, D.B. (1985). Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *The American Statistician*, 39(1), 33-38.
- [AQ3]Saylor, W.G., & Gaes, G.G. (1987, November). Post Release Employment Project: The Effects of Work Skills Acquisition in Prison on Post Release Employment. Presented at The American Society of Criminology Meeting, Montreal, Canada.
- Saylor, W.G., & Gaes, G.G. (1997). Training inmates through industrial work participation and vocational and apprenticeship instruction. *Corrections Management Quarterly*, 1(2), 32-43.

---

## ENDNOTES

1. UNICOR is the component of the Federal Bureau of Prisons that has operational responsibility for all federal prison industries.
2. The propensity score is one of the essential components to the techniques described by Rosenbaum and Rubin (1984, 1985) to match comparison members to program participants. Essentially, the propensity score is the predicted log odds of participating in training programs and is a function of a large set of covariates that are theoretically linked to program participation. The propensity score is intended to measure an individual's propensity to self-select himself or herself into the training programs. Therefore, inmates who did not participate in training, yet had large propensity scores similar to the training participants, are considered the "best" comparison subjects.

A training program is only effective for individuals who are willing to participate. Consequently, we are interested in comparing the outcomes of individuals who did participate to those who we believe might have participated if the opportunity had been presented. Typically there is a greater demand for industries jobs than there are jobs to be filled. Because of the excess demand for industries jobs, inmates who were not employed by UNICOR, but who had large propensity scores, may well have been interested in participating in the Bureau's Industries program had a job been

available for them. When these individuals can be identified, they make up an unbiased (or less biased) comparison group because they look like the study group members in terms of their prior incarcerations, sociodemographic characteristics, criminal histories, and institutional adjustment measures that are associated with program participation. The propensity score is a technique that allows for the identification and selection of these individuals. We have demonstrated previously (Saylor & Gaes, 1987) that the use of the propensity score resulted in a group of comparison individuals who were virtually indistinguishable from study group members (based on the sociodemographic, criminal history, and institutional adjustment measures). Consequently, if the two groups of individuals look virtually identical when they arrive at the Bureau's front door, it seems plausible that at least part of any difference we observe in the outcomes of the group members may be due to the BOP programming experience of the study group members.

The propensity score along with other covariates was used to select comparison subjects from a large "reservoir" of potential matches. The comparison reservoir for each of our study group

members was composed of all other inmates in the BOP population who were released in the same year and calendar quarter as the study group member for which a match was being sought. The matching algorithm used a geometric distance measure (Mahalanobis distance) to select a comparison subject that was most similar to a training subject within classes defined by the inmate's sociodemographic and criminal history characteristics. Specifically, the algorithm required an exact match of sex, race, Hispanic ethnicity, and security/custody level. The security/custody level is determined by a classification device used by the BOP to determine an inmate's security and custody needs and is based on the inmate's current offense severity, prior incarceration history, and current institutional adjustment. In addition the algorithm chose the closest propensity score match based on the minimum Mahalanobis distance between each study member's score and the score of each individual from the comparison reservoir. We also used the propensity score retrospectively to further control for selection bias after the comparison group members had been determined, as was recommended by Rosenbaum and Rubin (1985).