THE SANDHILLS VOCATIONAL DELIVERY SYSTEM EXPERIMENT

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THE SANDHILLS VOCATIONAL DELIVERY SYSTEM EXPERIMENT:

AN EXAMINATION OF CORRECTIONAL PROGRAM IMPLEMENTATION AND EFFECTIVENESS

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Abstract

This report details the findings of a four-and-a-half year study of the implementation and effectiveness of a vocational rehabilitation program for 18-to-22-year-old male property offenders. The study included analyses pertaining to treatment integrity which examined how well the rehabilitation program was implemented, as well as analyses pertaining to the implementation and integrity of the true experimental design imposed for the evaluation. Three study groups were randomly identified. An experimental and control group within the facility offering the program and a control (comparison) group which was not assigned to this facility. This second group of analyses were directed at identifying the differences in treatment of the experimental and control groups. The results suggest that the program was effective in increasing the level of vocational skills of the program participants, although only a few members of each group successfully completed programs.

The effects of the program on post-release employment and post-release criminality are also addressed. Specifically, analyses of post-release activities (for example, employed, not employed) and wages are reported. No significant differences in employment outcomes were identified. Interpretations of these findings, however, are subject to the following qualifications: (1) the difference in treatment between the experimental and the internal control groups may not have been large enough to effect improvement in post-release employment and (2) the experimental and the internal control groups were serving, on average, longer sentences than the external control group. Survival analysis techniques were used to characterize the timing until first arrest and first re-incarceration following release from prison.

Preface

In February 1983, the Correctional Programs Committee of the North Carolina Employment and Training Council recommended a rigorous evaluation of the effectiveness of a newly strengthened vocational rehabilitation program offered at two prisons for 18-to-22-year-old offenders. The vocational program was the Sandhills Vocational Delivery System (VDS), which had been under development since the early 1970's, was offered at Cameron Morrison Youth Center (CMYC) and Sandhills Youth Center (SYC). The VDS was characterized by its inter-agency nature, namely it represented an effort to jointly apply the resources of the Department of Correction, the Employment Security Commission, the Department of Community Colleges, and the Division of Vocational Rehabilitation of the Department of Human Resources to the task of improving the vocational skills and post-release job opportunities of youthful offenders.

A true experimental design was established for the VDS program evaluation. This type of experimental design entails random assignment of individuals to treatment and non-treatment groups. The strength of this design is to increase confidence that results are due to treatment and not to differences in the characteristics of the subjects. The VDS evaluation included two stages of random assignment. In Stage I, offenders were assigned to either an external control group or to a group to be transferred to CMYC. In Stage II, those transferred to CMYC were randomly assigned to either an internal control group or to an experimental group. Thus, three evaluation groups were identified: (1) an experimental group, (2) an internal control group, and (3) an external control group. The experimental group was designated to receive all elements of the VDS program, while members of the internal control group received some elements of the program (on an availability basis). Those assigned to the ex-

ternal control group received no VDS elements, as the VDS program is not available at North Carolina prisons other than CMYC and SYC.

The evaluation was directed at testing an economic model of criminal behavior, namely that individuals choose crime as a career when returns to crime (criminal "wages") are higher than returns to legitimate employment. This model yields the following testable hypotheses: (1) the integrated delivery of training and job-placement services results in a higher level of vocational skills for offenders; (2) these greater skills increase post-release job opportunities and wages; and (3) improved legitimate wages reduce recidivism.

Acknowledgements

The work to evaluate the Sandhills VDS project was possible only because of the cooperation and efforts of many individuals in the Department of Correction, the Department of Natural Resources and Community Development, and the Employment and Security Commission. The continued support of the North Carolina Job Training Council (formerly the NC Employment and Training Council) and the administrators of the agencies it comprises for the Sandhills VDS project were also essential to the continuation of this work.

Special thanks are due to the administrators and the staffs of Cameron Morrison Youth Center and Sandhills Youth Center for their efforts to implement the VDS program and to collect the data needed for the evaluation; to the administration and staff of Harnett Youth Center and the administration and staff of Polk Youth Center for their cooperation in identifying the "eligibles," randomly selecting the external control group and providing enrollment information for members of the external control group; to Hattie Pimpong and Mary Perry of the Classification Division of DOC for their tireless efforts to collect transfer and follow-up information for the external control group; to Ken Parker, Manager of Research and Planning at DOC, for his advice and support of the project; to Mel Starnes, Sterge Costa and the offender specialists of ESC for their efforts to implement and improve the VDS, to collect the follow-up data, and to provide a forum for VDS coordination; and to the parole officers of the Division of Adult Probation and Parole, DOC, for the collection of follow-up information. The individuals at the ESC, DOC and PIN who provided data bases for the analyses are also acknowledged.

Special thanks are also due to George O'Hanlon for his efforts to facilitate the establishment of the VDS and to acquire resources for the funding of the evaluation. Finally, thanks are ex-

tended to Gary Gottfredson of The Johns Hopkins University for his support and assistance in the evaluation.

Initial funding for the evaluation was provided by the University of North Carolina, the North Carolina Department of Correction, and the North Carolina Department of Natural Resources and Community Development. Completion of the evaluation was made possible by the generous support of the National Institute of Justice since the Fall of 1985.

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I.0. INTRODUCTION

Reducing recidivism through rehabilitative programs could provide a partial solution to the problem of over-crowded prisons. Hundreds and, perhaps, thousands of programs have been offered at prisons throughout the country with the intent of effecting a reduction in recidivism. Of the rehabilitation programs which have been evaluated for their effectiveness, few have proven "successful." Specifically, few studies have revealed statistically significant differences in the incidence of recidivism for those who participated in the programs and those who did not. An extensive review of the rehabilitation literature led Martinson (1974) to the conclusion that "nothing works."[1] Others, however, insist that this conclusion is premature. For example, James Q. Wilson (1983) has stated, "The conclusion that Martinson was right does not mean that he or anyone else has proved 'nothing works,' only that nobody has proved that something works." Wilson's view is supportive of the major findings of a National Academy of Sciences' Panel (Sechrest, White, and Brown 1979). This NAS Panel (the Panel on Research on Rehabilitative Techniques) revisited the literature on correctional rehabiliatation programs and identified the following weaknesses in the rehabilitative program(s) or the evaluation methodologies applied to determine program effectiveness:

1. Few of the programs which had been studied were theoretically based. In other words, the question "Why should this program affect post-release behavior?" was not addressed.
2. The content of the rehabilitation program was often poorly defined. For example, what is "counselling"?
3. The delivery of the program was seldom monitored, leaving unanswered the question "What did the participants actually receive?".

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[1] For a review of this literature see Lipton, Martinson and Wilks 1975 and the assessment of this work presented in Fienberg and Grambsch 1979. A more recent presentation of the "Martinson conclusion" was offered by Englender 1983; a response is in Lattimore and Witte 1985.

4. The evaluation methodology was seldom based on a true experimental design, which could increase confidence in the results.
5. Sample sizes were often small, reducing the power of statistical tests.

Rezmovic (1979, 1984) specifically raised the issue of "treatment integrity" in an excellent article on the problems facing social researchers studying correctional programs. She defined treatment integrity as "how well treatment practice conforms to treatment plan" (item 3 in the above list) and pointed out that evaluators who have not measured treatment integrity often find "themselves at a loss to explain why a a particular intervention did or did not produce the expected effects" (Rezmovic 1984). The appropriate response by evaluators, Rezmovic suggested, is to monitor treatment, to find out what is in the treatment "black box."

This report presents the results of a four-and-a-half year evaluation of a vocational rehabilitation program for 18-to-22-year-old male offenders--the Sandhills Vocational Delivery System (VDS). The VDS program is offered at Cameron Morrison Youth Center (CMYC) and Sandhills Youth Center (SYC), facilities which house, respectively, medium/minimum custody and minimum custody offenders. The VDS and the evaluation were designed to accommodate the limitations outlined above. Specifically,

1. The VDS is based on an economic model of crime and, thus, is theoretically premised.
2. The components of the VDS were identified prior to the initiation of the evaluation, thus specifying the contents of the treatment plan.
3. A true experimental design was developed, implemented, and monitored for the assignment of offenders to the program or to control groups.
4. Over 800 offenders were randomly assigned to three study groups, assuring (at the least) that our samples are not "small."
5. Every effort was made to monitor program delivery, in other words to determine what program elements were actually received by participants.
6. Finally, a large data base of follow-up data was established to analyze program effectiveness.

The evaluation of the VDS program began in June 1983 with the initiation of the enrollment of individuals into the study groups. Enrollment of individuals into the study continued through June 1986 and data collection continued through August 1987. Our report follows an outline suggested by the above list. First, we will discuss the VDS program, addressing the question

of what the subjects should have received (the treatment plan), and the experimental design. After a description of our data and our subject groups, we address the question of treatment integrity and delivery--we evaluate how well the VDS program was provided. The remainder of the report is devoted to the question of program effectiveness and our summary and conclusions. More specifically,

1. Chapter 2 describes the VDS program, detailing its theoretical basis and its evolution as a rehabilitation program.
2. Chapter 3 describes the experimental design. This chapter describes both the original design and a modified design that was adopted in November 1984. Reasons for the modification are also briefly reviewed.
3. Chapter 4 describes the data which were collected for the evaluation. Data were collected specifically for the evaluation, as well as from the files of appropriate government agencies (the NC Department of Correction, the Employment Security Commission, and the Police Information Network).
4. Chapter 5 characterizes our three study groups.
5. Chapter 6 discusses the delivery of the VDS program to participants, examining how well treatment compared with the treatment plan and how effective the program was in increasing the vocational skill of participants.
6. Chapter 7 compares the post-release employment of the study groups.
7. Chapter 8 compares the post-release recidivism of the study groups.
8. Chapter 9 presents our summary and conclusions.

2.0 The VDS: Theoretical Basis and Components

The offender vocational and employment program which became known as the Vocational Delivery System (VDS) is offered at Cameron Morrison and Sandhills Youth Centers (CMYC and SYC or CMYC/SYC).[2] These two facilities are located about 30 miles apart in the Piedmont region of North Carolina. CMYC is a medium- and minimum-custody facility for male 18-to-22-year-old offenders ("youthful offenders" in NC).[3] SYC is a minimum-custody facility and serves as a "sister" institution to CMYC in that offenders are usually transferred from CMYC to SYC when they achieve minimum-custody status. Male offenders are generally transferred to CMYC from Polk or Harnett Youth Centers.

This chapter describes the theoretical basis of the VDS (section 2.1) which provides the three testable hypotheses for our study. Section 2.2 provides a description of the VDS program, the treatment plan.

2.1 Theoretical Basis of the VDS

The lack of a theoretical basis for the rehabilitation program has been cited as a major

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[2] These two facilities were operated as a single administrative unit, the Sandhills Youth Complex when the evaluation began. The facilities were designated as separate operating units shortly thereafter.

[3] When the study began, CMYC had the distinction of being the only co-educational prison in North Carolina. Thus, female offenders were initially included in the evaluation. The female offenders were transferred to another facility in early 1984 and, subsequently, were dropped from the study.

weakness in many correctional programs.[4] The purpose of theory is to identify the causal link between treatment (for example, program participation) and outcome (for example, reduced recidivism). The Vocational Delivery System, which offers an integrated training and job-placement program, is based on an economic model of criminal behavior. The economic model of criminal behavior was first suggested by Gary Becker (1968). Subsequent theoretical work on this economic model has been provided by Ehrlich (1973, 1977), Block and Heineke (1975), and Witte (1980). The economic model asserts that criminal behavior is the rational result of an individual weighing the costs and benefits of anticipated illegal and legal activities and choosing to commit the act which offers the greatest expected returns. Thus, Becker (1976) noted, "Some persons become 'criminals,' therefore, not because their basic motivation differs from that of other persons, but because their costs and benefits differ." Intuitively, this model appears more appropriate for crimes that generate income such as burglary or robbery, although it has been applied to "crimes of passion." (See, for example, Ehrlich 1975; Lachman 1978; Long, Witte and Karr 1983.)

The economic model suggests that criminal behavior can be affected by:

1. Increasing the costs of engaging in crime, for example by imposing longer sentences or "stiffer" fines; or
2. Increasing the returns to legitimate activity, for example by providing job skills that would enable the individual to earn a "decent" legitimate wage.

The VDS is an effort to enhance legal returns and is, thus, based on the second implication of the economic model.

As was noted, the importance of a theoretical model is to identify causal links between program elements and outcomes. The economic model as applied to the VDS program yields the three "links" shown in Figure 1.

These "links," in turn, suggest the following testable hypotheses for the evaluation:

1. Does the VDS improve the job skills of participants?

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[4] This issue was identified as the first "weakness" of previous research in Chapter 1. This finding is discussed in some detail in in Sechrest, White and Brown 1979.

I. Evaluation & Vocational Training --> Improved Job Skills

II. Improved Job Skills & Job Placement Services --> Better Job

III. Better Job --> Reduced Recidivism

Figure 1. The links between the VDS program and reduced recidivism: This figure shows the theoretical links relating the VDS program to a hypothesized reduction in recidivism.

2. Do these skills and assistance in locating employment result in better-paying or more satisfying jobs post release?
3. Are offenders in better jobs less likely to recidivate?

As this model seems particularly appropriate for economically motivated offenders, the VDS evaluation focused on property offenders.

The model has not been explicitly tested in previous research. Items I through III suggest that reduced recidivism--the goal of the VDS program (item III)--is conditional on objectives I and II being achieved. Specifically, the model implies that **IF** evaluation and job training result in an improvement in job skills and **IF** these improved skills and job placement assistance result in a "better" job, **THEN** we should observe a reduction in recidivism. On the other hand, if evaluation and job training do not improve skills or if improved skills and job placement do not result in a better job, then the model asserts that reduced recidivism is unlikely to occur.[5] The next section discusses the history and components of the VDS program.

[5] More specifically, we should say that if I and II are not met and we observe a reduction in recidivism, we cannot claim that the VDS was responsible for this reduction. Some other factor--or chance--must be responsible.

2.2 The VDS Program

The VDS was originally conceived in the early 1970's as an effort to improve the post-release employment prospects of offenders. The premise of the program is to work with each offender to identify potential vocational skills, develop a plan of eductional and vocational training which will enhance those skills, provide the programs identified in the plan, and assist in locating post-release employment. The Department of Correction, the Department of Community Colleges, the Division of Vocational Rehabilitation of the Department of Human Resources, and the Employment Security Commission are participants in the program. These agencies and the Correctional Programs Committee of the North Carolina Employment and Training Council have participated in the evolution and strengthening of the VDS program throughout the years.

The components of the VDS were implicitly defined during the formative years of the program. In 1983, the Correctional Programs Committee evaluated the VDS program and recommended several changes that would strengthen the program.[6] The VDS program, which was to be implemented at CMYC and SYC and was to be the subject of the evaluation, was defined to include the following elements:

1. Three weeks of intensive vocational evaluation, testing, and counselling.[7] Additionally, case managers are encouraged to talk with ESC personnel in the county to which the offender intended to return about the availability of jobs requiring the vocational skills of interest to the offender. The evaluation step is designed to identify the most appropriate programs for each offender.
2. Development of a correctional plan, based on the results of the testing in step 1, which provides a basis for assignment of inmates to educational, vocational, and enrichment programs.
3. Monitoring of the inmate's progress with respect to his correctional plan. Special attention is given to VDS participants to assure that they are not reassigned from the programs designed to improve their post-release employability.

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[6] Results of this evaluation and the details of the recommendations for improvements are included in the "Special Report by the Correctional Programs Committee of the North Carolina Employment and Training Council Concerning Program Evaluation at Sandhills Youth Complex," February 1983.

[7] Evaluation of vocational interests and aptitudes included the following tests: (1) either the Career Assessment Inventory or the Wide Range Interest-Opinion Test, depending of the offender's reading skills; (2) the General Aptitude Test Battery; and, as required to establish aptitude, (3) Crawford Small Parts Dexterity Test or Valpar coordination test, Bennet mechanical or clerical comprehension tests, and Snellen Chart for visual acuity or Dvorine color vision test. Additional assistance was provided to acquaint the subject with a selected occupation through, for example, work samples.

4. Development of a Mutual Agreement Parole Program (MAPP) contract, which guarantees a parole date (given that the offender conforms with the requirements of the MAPP) and, thus, identifies when an individual will be available for post-release employment. This step is seen as improving job placement with private employers, as a job developer or placement specialist can guarantee when the offender will be available for work.

5. Provision of Community Re-entry Training (CRT), a program that provides special training in how to get along in the workplace and the free community. The training focuses on interviewing for jobs, workplace etiquette, grooming, money management, and other skills that will help participants acquire and keep jobs and manage their lives productively.

6. Job development, meaning assistance prior to release in securing post-release employment. Job development is provided by job development specialists at SYC and by Employment Security Commission offender specialists. The efforts of these individuals are directed at trying to place offenders in training-related employment.

As can be seen the VDS is an ambitious program that attempts to assist the offender in developing and marketing vocational skills. Additionally, the VDS attempts to assure that the offender acquires basic educational skills (reading, writing, and math), counselling for substance abuse and other psychological problems, and "living skills" necessary for "survival" in the "real world." The intent is to improve his chances of finding and keeping employment, post-release. Further, it might be said, that the VDS provides a contract --the correctional program plan--between the offender and the Department of Correction. The contract identifies what is expected of the offender and what will be provided by the Department of Correction.

None of the elements listed above is unique to the VDS program. The uniqueness of the VDS lies in the extent to which the activities of individuals responsible for individual elements are coordinated and integrated to provide the best possible use of existing resources. Thus, the VDS provides a **system** for enhancing the post-release employability of youthful offenders. A brief description of the vocational, academic, and enrichment programs offered at CMYC and SYC is provided in the following sections.

2.2.1 Vocational Programs at CMYC and SYC

Results of the evaluation are useful only to the extent that vocational training commensurate with a participant's interests and aptitudes is available at CMYC, SYC, or, if study release is recommended, Sandhills Community College. The programs available at CMYC and SYC in-

clude those in construction trades, office management, mechanics, and metal working. The following programs are offered at CMYC:

- Auto mechanics
- Brick masonry
- Carpentry
- Electrical wiring
- Graphic arts
- Heating and air conditioning
- Mechanical maintenance
- Office management
- Plumbing
- Upholstery

SYC offers the following programs:

- Graphic arts
- Light construction (building trades)
- Mechanical maintenance
- Metal working (welding)

Additionally, a course in Food Service was offered during the first year of the evaluation. This program was dropped after a survey of regional restaurants revealed that they preferred to train their own employees. The basic course in each of these programs is 6 weeks in length, with the exception of auto mechanics (13 weeks), graphic arts (6 months), office management (12 weeks), and upholstery (12 weeks). Participants who complete the basic course can continue in the program to further develop their skills as all offerings are "open ended." Completion of a program is marked by the award of a certificate which indicates the specific skills mastered by the participant.

Although the vocational programs offered at CMYC and SYC are considered a strength of the VDS program, two shortcomings should be noted. First, the vocational offerings are concen-

trated in the construction and mechanical trades.[8] Thus, if the evaluation process indicated that a participant had an aptitude or interest in, for example, photography, he could not be assigned to an "appropriate" program. Secondly, the 6 weeks of training provided in the basic course is probably too short to allow participants to achieve any significant proficiency at a trade. The ESC offender specialists, in particular, noted that 6 months of training is generally considered the minimum for achieving a marketable level of skills. The administration and personnel at CMYC and SYC were aware of these deficiencies, but were constrained by resources in their efforts to remedy these problems.

2.2.2 Other Programs at CMYC and SYC

In addition to the vocational programs described in the previous section, CMYC and SYC offer a variety of academic, personal enrichment, work detail, and incentive wage programs. The academic programs include basic education (for example, vocational math or reading classes), classes leading to the GED, and post-GED classes for advanced training. Study release at Sandhills Community College is also available for some inmates. The personal enrichment programs include substance abuse groups such as Alcoholics Anonymous, "fun" activities such as Explorers or Jaycees, programs to increase self-esteem such as I-Can, and religious classes. Most work details are within the prisons, for example kitchen or laundry duty, but some offenders are assigned to Department of Transportation road crews. Other work assignments include assisting with vocational or academic classes as an aide. Incentive wages are offered for some of the work assignments.[9]

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[8] Only a few evaluation subjects participated in either the graphics arts or the office management course, none completed the upholstery course.

[9] In an effort to acquaint inmates with the process of applying for employment in the "real world," an application process was instituted at CMYC for the work details.

2.3 Comments on VDS Weaknesses

The VDS is a "strong" vocational rehabilitation program as compared to many prison programs. Its strength lies in the extent to which various services have been integrated. The VDS also has several potential weaknesses. The first of these is the length of time participants spend in programs; specifically, the six weeks which comprise most of the basic program offerings may be too short to provide any appreciable level of skills. Secondly, most vocational programs are in construction or mechanical maintenance trades; thus, offenders with interests in other areas may not have the opportunity to learn appropriate skills. Thirdly, during Phase I of the evaluation, offenders in vocational programs did not earn "gain time" for the days spent in class, while those participating in work assignments earned gain time. Thus, some VDS participants felt penalized by their assignment to the program in that the vocational training potentially extended the length of time they would serve in prison. Prison policy was changed mid-way through the program so that offenders could also earn gain time for academic and vocational training.

2.4 Summary of the VDS Program

This chapter described the VDS program, detailing its theoretical basis and its evolution as a rehabilitative program. The VDS is an integrated evaluation, training and job-placement program which is based on an economic model of criminal behavior. Specifically, the economic model asserts that criminal behavior is the rational result of an individual weighing the costs and benefits of an illegal activity versus the costs and benefits of a legal activity and choosing the illegal activity when the expected returns appear greater than the returns to the legal activity. The VDS program attempts to affect criminal behavior by increasing the returns to legitimate activity, that is, by providing job skills that would enable an individual to earn a "decent" legitimate wage and therefore, desist, from engaging in illegal activities.

The underlying assumption of an economic model of criminal behavior when imposed on the VDS suggests the following causal links between program elements and outcomes:

1. Evaluation and vocational training lead to improved job skills;
2. Improved job skills and job placement services result in a "better" job post release; and
3. A better job will encourage the ex-offender to desist from crime and, thus, result in reduced recidivism.

These relationships were shown in Figure 1. The interdependence of the hypotheses suggested by the causal links are the primary motivators of the VDS implementation and evaluation. Thus, the VDS provides a framework in which to establish these links and evaluate the validity of the hypotheses under consideration.

Following this description, we described the VDS program. Although the components of the VDS are not unique to either the CMYC or the SYC facilities, the integration of these program elements provided a unique opportunity to evaluate the effectiveness of program implementation on post-release employment and (vis-a-vis the economic model of criminal behavior) post-release recidivism. The VDS program includes the following elements:

1. Evaluation and counselling with respect to vocational skills and aptitudes;
2. Development of a correctional program;
3. Monitoring of inmate progress;
4. Identification of when an inmate will be available for post-release employment;
5. Community re-entry training; and
6. Job development and assistance in securing post-release employment.

Thus, the VDS is a unique and ambitious program which attempts to assist offenders in developing and marketing vocational skills. At the outset, therefore, the VDS is designed to provide offenders with those skills which will result in their pursuing legal activity over illegal activity. Finally, we identified several potential shortcomings of the VDS.

3.0 VDS Experimental Design

The Sandhills Vocational Delivery System (VDS) project was designed to address the criticisms of earlier studies of rehabilitation programs through an integrated program of vocational delivery and evaluation. Preparation for the evaluation revealed areas in which the VDS program could be strengthened and generated an explicit listing of the elements of the VDS. Additionally, it was expected that results forthcoming from the evaluation would reveal how well the VDS was being implemented and identify areas requiring additional improvement. The "corner stone" of the VDS evaluation was the implementation of a true experimental design which randomly assigned subjects to groups which were differentiable on the basis of their exposure to the VDS. The importance of the use of a true experimental design was stated by Rezmovic (1979, p. 165), "True experiments, involving random assignments of subjects to experimental and control conditions, provide the most secure and valid means of assuring that the results of a study are due to the manipulated variables, rather than to systematically biasing factors."

The original design required random assignment of subjects to either an experimental group, an internal control group or an external control group. The experimental and internal control group members received VDS services, with the internal control subjects receiving fewer of the services. Both of these groups were assigned to CMYC and SYC and constitute our **intra-facility comparison groups**. External control group members were assigned to facilities other than CMYC and SYC and did not receive any of the VDS services. The external control group and the two groups assigned to CMYC/SYC provide the two **inter-facility comparison groups**. *A priori*, the inter-facility comparison was expected to provide a statistically more powerful test of the effectiveness of the VDS program as the difference in treatment between

the two inter-facility groups (no VDS services versus at least some VDS services) is greater than the difference in treatment between the intra-facility comparison groups (some VDS services versus "all" VDS services).[10]

This chapter describes the original experimental design and discusses the factors which forced the design to be modified in November 1984. Section 3.1 provides an overview of the evaluation design. Section 3.2 outlines the selection and randomization procedures used to implement the original experimental design in June 1983. Those factors which forced the design to be modified are also presented. Section 3.3 presents the modified experimental design which was implemented in November 1984 and remained intact until the completion of the enrollment in June 1986. Section 3.4 briefly outlines the methodological approach to the analyses of our data. A summary of the chapter is presented in Section 3.5.

3.1 Overview of the VDS Evaluation Design

The VDS evaluation was based on the implementation of a true experimental design which randomly assigned offenders to one of three evaluation groups (one experimental and two control groups). The original design, begun in June 1983, included two stages of randomization to provide both an intra-facility control group at the CMYC/SYC facilities and an inter-institutional control group away from the CMYC/SYC facilities (most were assigned to the Polk and Harnett Youth Centers). The external control group was thought to be of particular importance given that all inmates at the CMYC/SYC facilities receive some VDS services, while the Polk/Harnett inmates do not. Thus, the post-release difference between the intra-institutional control and experimental groups was expected, *a priori*, to be less than the difference between the VDS participants and the Polk/Harnett control group.

Based on projections of the arrival and length-of-stay of inmates within the youth prison system of North Carolina, it was anticipated that a study population (200-plus in each group) could

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[10] The importance of statistical power in tests of the effectiveness of treatment is addressed in Cohen 1977.

be identified by June 1984 and that most of the subjects would be released within two years. These estimates proved to be erroneous for two reasons. First, the number of youthful offenders entering the North Carolina prison system declined significantly concurrent with the start of enrollment. Secondly, identifying those inmates arriving at CMYC who would remain in prison for an appropriate (for the study) length of time proved to be difficult. As a result of these factors, it was necessary to modify the original design in November 1984. Because of the decline in the NC youth prison population, it was necessary to eliminate the first stage of randomization, thus eliminating the external control group. Inter-facility comparisons of post-release behavior could be made, however, for those enrolled between June 3, 1983 and November 4, 1984. This modified design was somewhat weaker than the original design in the sense that inter-facility comparisons are not possible over the entire study period. The modified design does, however, include all of the elements of a true experimental design as described earlier. To offset the decrease in power which accompanied the loss of the external control group, the enrollment period was extended to increase the number of subjects in the study groups.

The next section describes the original experimental design; section 3.3 describes the modifications made to the design and discusses their impact on the analyses.

3.2 Original VDS Evaluation Design

The original evaluation design was implemented in June 1983. The original design is shown in Figure 2.

The original two-stage design consisted of the following elements:

1. Identification of inmates at Polk and Harnett Youth Centers who met the Division of Prison's criteria for transfer to Cameron Morrison Youth Center (CMYC). This group was designated the group of "eligibles."
2. Random assignment (1:1 or, if necessary, 1:2) of eligible inmates either to the external (Polk/Harnett) control group or to transfer to CMYC.
3. Screening of eligibles arriving at CMYC to identify those meeting the study selection criteria; these individuals comprised the group of "amenables."

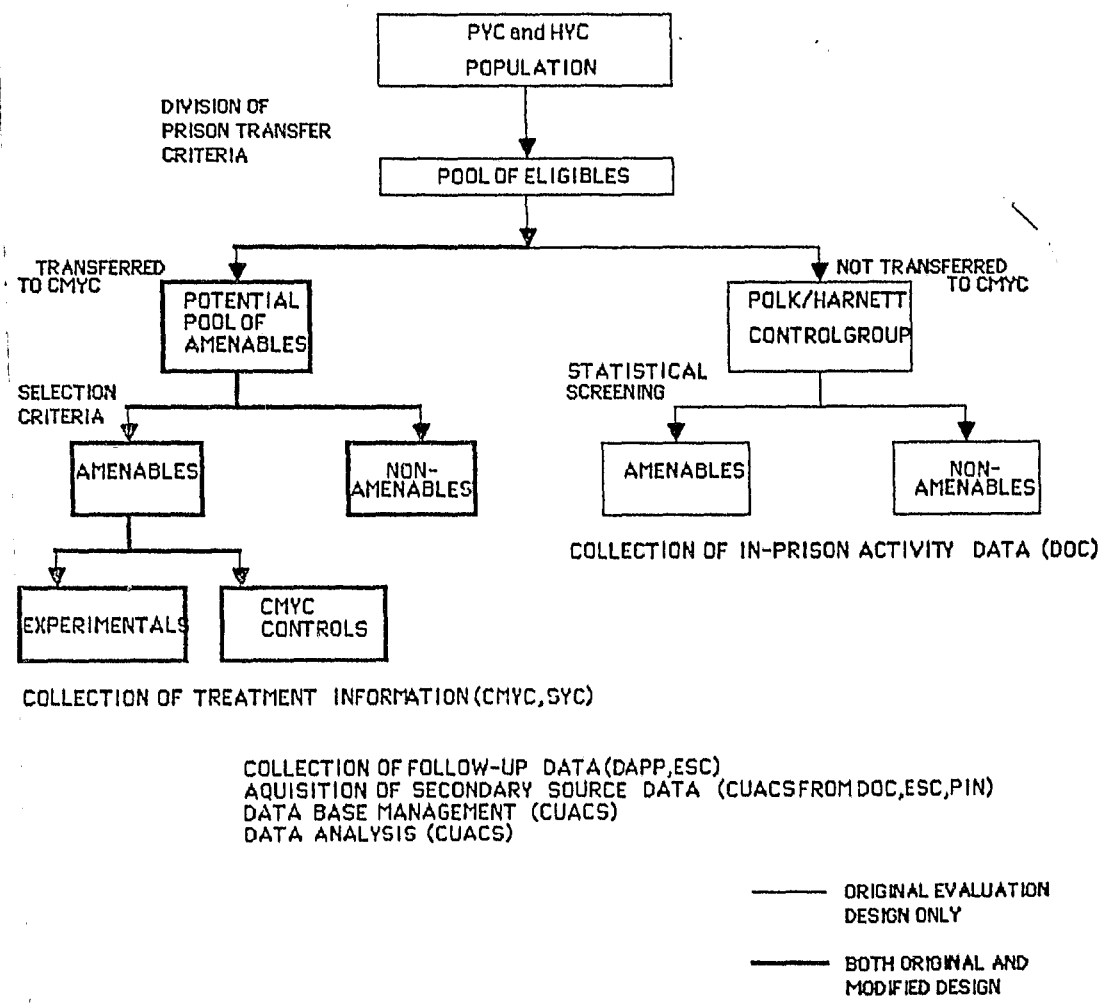

Figure 2. Original and modified evaluation design: The original design was in effect between June 3, 1983 and November 4, 1984. The modified design was implemented on November 5, 1984. Enrollment ended June 1, 1986.

4. Random assignment (1:1) of amenable inmates to either the experimental group or the internal (CMYC) control group.

5. Statistical screening of the external control group to identify those who met the statistical criteria being applied at CMYC, in other words, to identify the Polk/Harnett amenables.

6. Data analysis to determine program effectiveness. Comparison of post-release outcomes (labor market performance and criminality) for:

   a. Experimental group and internal control group (intra-facility comparison); and

b. Experimental plus internal control group and external control group (inter-facility comparison).

Section 3.2.1 describes the selection and randomization procedures in some detail. Section 3.3.2 addresses the implementation of the original design.

3.2.1 Selection and Randomization Procedures

The first stage of randomization occurred at Polk and Harnett Youth Centers and the second stage at Cameron Morrison. According to the Department of Correction, the following criteria were used to assign male offenders to CMYC:

1. Male inmates ages 18 to 21;
2. Inmates convicted of non-assaultive crimes, who have non-assaultive histories, serving total sentences of 15 years or less. Non-assaultive crime categories will be same or similar to those found in the Fair Sentencing legislation, Classes H, I, and J.
3. First offenders, committed youthful offenders (CYO's) and regular youthful offenders (RYO's), in addition to multiple offenders who have no history of violence, aggressive behavior, or other negative/serious institutional adjustment records may be assigned to CMYC.
4. Non-assaultive mentally retarded offenders with a Beta IQ of 40 to 70 can be assigned to special programs at CMYC. Mentally retarded inmates who may not be assigned to CMYC are those who (a) are sexually aggressive, (b) have a history of violence or aggressive behavior, and/or (c) require special services for management purposes.

Those meeting criteria (1) through (3) were determined to be, for the purposes of the evaluation, "eligible" for transfer to CMYC. All inmates arriving at Polk and Harnett who met these criteria were assigned to a "pool of eligibles," their names were listed alphabetically and randomization was accomplished by assigning even-numbered offenders to CMYC and odd-numbered offenders to the PYC/HYC control group (even and odd numbered assignments were rotated each week). Offenders assigned to CMYC because of criterion (4) as well as inmates transferred to CMYC for safe custody, were not included in the pool of eligibles.[11]

The eligible offenders who were transferred to CMYC were screened against specified criteria (described below) and categorized as either amenable (to the program) or non-amenable. Those categorized as amenable were randomly assigned to either the experimental or the

[11] Misdemeanants were also excluded from the study. All participants were convicted felons.

internal control group. Those categorized as non-amenable were excluded from the study. The amenability criteria were based on the theoretical (i.e., economic) model underlying the program. Specifically, it seemed that economically motivated offenders would be those most responsive (amenable) to the VDS and that the inmate would have to remain at CMYC and SYC long enough to be exposed to the full program. Eight months from admission to release was determined to be the minimum length of stay for which an effect could reasonably be expected, a maximum length of stay of 3 years was also established.[12] Other criteria were established to enhance the probability of post-release employability -- normal intelligence and no physical disabilities. To facilitate follow-up of releasees, individuals who were to be released out-of state were eliminated. Thus, the population of interest -- those considered most amenable to the VDS -- was selected on the basis of the following criteria:

1. Income-producing offense (specified by NC crime code to include robbery, breaking and entering (and larceny), shoplifting, auto theft, embezzlement and fraud, drug trafficking, and other offenses that produce income);
2. Expected stay (at CMYC and SYC) of 8 months to 3 years;
3. IQ greater than or equal to 70;
4. Health grade A (good);
5. In-state release (expected).

Each of these criteria was objective and easy to apply in screening with the exception of criterion 2. The "objective" information known about an offender is his sentence length -- not how long he will remain in prison. Establishing an accurate correlation between sentence length and length of stay was more difficult because North Carolina youthful offenders are adjudicated under two different sentencing alternatives. Regular youthful offenders (RYO's) are sentenced under the NC Fair Sentencing Act and receive determinate sentences. Committed youthful offenders (CYO's) receive indeterminate sentences in that, by law, they can be released after serving only one day of their sentence. For an RYO, the time served also varies greatly depending on the amount of "gain time" the individual earns (e.g., by working in the kitchen) and on his behavior (e.g., the number and type of infractions committed). An RYO who commits no infractions and earns no gain time will normally serve 50 percent of his

[12] The 8-month period was established by assuming 1 month for processing, 6 months in the program, and 1 month for community re-entry training. The maximum length of stay was established to assure that the inmate would not complete the VDS program "years" before being released from prison.

sentence minus an "automatic" 90-day early parole. A CYO is released at the discretion of the NC Parole Commission, generally after serving 10-to-40 percent of a sentence; CYO's are also eligible to earn gain time, but to date are not awarded early parole. On the basis of these stipulations, criterion 2, the length-of-stay criterion, was amended to specify

- CYO's with a sentence length of 5 or more years, and
- RYO's with a sentence length of from 2 to 10 years.

3.2.2 Implementation of the Original Evaluation Design

The validity of the experimental design for the VDS evaluation rested on adherance to the selection and randomization procedures by those individuals responsible for enrolling offenders into three study groups. During the initial months of enrollment, minor problems concerning interpretation of the selection criteria were corrected. It was expected, based on preliminary estimates, that approximately 200 experimentals and 200 internal controls would be identified by June 1984. An external control group of 300 to 400 was also expected. After one year of enrollment, only 74 experimentals and 79 internal controls had been identified at CMYC/SYC, and 186 controls had been identified at PYC and HYC. This smaller than expected enrollment led to an investigation of causes and to modification of the experimental design in late 1984. The modified design is described in the next section.

3.3 Modified Experimental Design

The failure to enroll the expected number of study participants after one year was due to two factors:

1. A decline in the number of youthful offenders in North Carolina, concurrent with a decline in the crime rate; and
2. Problems establishing of an objective criterion for identifying CMYC amenables who would serve 8 month to 3 years.

The first factor affected the ability of the DOC to continue allowing selection of the external control group. The second resulted in a change in the sentence length criterion for those

assigned to the control and experimental groups at CMYC. These factors, why they forced changes in the evaluation design, and some of the implications of these changes on the evaluation are discussed in this section.[13]

The first factor which affected the evaluation design was the decline in the youth prison population. Specifically, the evaluation design affected the movement of inmates within the NC prison system. The external control group included individuals eligible for transfer to CMYC who were randomly assigned **not** to be transferred to CMYC. At the inception of the project, there were more inmates eligible for transfer to CMYC than the facility could accommodate. Thus, random assignment was acceptable. Unfortunately (for the evaluation design), the decline in the number of individuals entering PYC and HYC, the need to retain members of the external control group at facilities other than CMYC, and the increase in space for male offenders at CMYC following the transfer of 80 female prisoners to another facility resulted in too few inmates at CMYC relative to other youthful offender facilities. This "population imbalance" created an operational problem for the DOC. Specifically, unlike when the evaluation was designed, there were too few inmates eligible for transfer to CMYC. As a result, in November 1984, the random identification of the external control group was suspended. The DOC agreed, however, not to transfer to CMYC those already designated to this evaluation group (whenever possible). This agreement maintained the integrity of the original design with respect to enrollment/assignment through November 1984, assuring that an external control group was available for part of the study period.

The decrease in the prison population at CMYC impacted on the evaluation in two ways. First, because there were fewer inmates, fewer programs were offered. Second, the original design was based on the assumption that access to programs by inmates would be restricted, largely as a function of the limited availability of these resources. Given that programs were a constrained resource, the DOC had agreed to give priority placement to the VDS participants (the experimentals). Thus, it was reasonable to assume that experimentals would participate (per the experimental design) in a greater share of programs. With CMYC "under-populated," most

[13] An extensive discussion of these issues and the analyses that led to the modifications is given in Lattimore and Witte 1985.

inmates could participate in most of the VDS services. This posed a potential problem for the study which relied upon the difference in treatment to "explain" any observed differences in post-release behavior.

The second factor affecting the enrollment of evaluation subjects was the definition of the sentence-length criteria for the identification at CMYC of amenables (those with the highest potential response to the VDS program). The sentence-length criteria was instituted to identify those who could be expected to be at CMYC/SYC between 8 months and 3 years. These criteria (specified in the previous section) were believed, when the study began, to include most inmates entering CMYC. During the first 15 months of enrollment (June 1983 through September 1985), approximately 100 experimental group members and 100 control group members were enrolled at CMYC. During the same period, more than 400 inmates who met all amenability criteria except the sentence-length criteria were excluded from the evaluation. Conversations with those applying the amenability criteria at CMYC revealed that most inmates were excluded because their expected length of stay was less than 8 months--either as defined by the sentence length criteria or because they were nearly 21 years old and were expected to be quickly transferred to an adult facility. Data analyses, however, failed to reveal a significant difference in the length-of-stay of those who had been enrolled and those who had been excluded (Lattimore and Witte, 1985). As a result of these analyses, the sentence-length criteria were changed in February 1985 to the following:

- Sentence length of two or more years for a CYO, or
- Sentence length of between two and eight years, inclusive, for an RYO.

The effect of the changes in enrollment procedures at CMYC was to restrict the experimental design to selection and randomization (see Figure 2). The selection and randomization procedures for this single-stage randomization design are identical to those used at CMYC under the original experimental design. The modified design encompassed the following changes:

1. Elimination of the selection and randomization of study group members at PYC and HYC, thus restricting the external control group to those previously identified.
2. Continuation of selection and random assignment of amenables to the experimental and internal control groups at CMYC.

3. Continuation of tracking and follow-up of all study group members, including those previously identified as external group control members.
4. Extension of the study period to allow identification of a larger study population (i.e., experimental and internal control groups) at CMYC/SYC.

The decision to identify a larger study population at CMYC was based on the requirement to assure adequate power for our statistical tests. The relationship between sample size, effect size, significance level, and power is discussed below. Restricting the evaluation to offenders at CMYC/SYC entails comparing the post-release behavior of a group of offenders who have participated in the VDS (the experimentals) and a group of offenders who have received some of the elements of the VDS (the internal controls). The VDS is hypothesized to improve post-release employment (wages, job satisfaction) and to reduce post-release criminality (e.g., time to first arrest post release, seriousness of post-release offense) for the members of the experimental group, although dramatic effects (halving the recidivism rate) are not expected.

As would be expected, the smaller the differences in outcomes, the "more difficult" it is to establish that those differences are statistically significant. Specifically, many statistical tests involve procedures designed to test the hypothesis that there is no difference in the outcomes of interest (e.g., the post-release recidivism rate of the experimentals equals the post-release recidivism rate of the controls or $RECID_E = RECID_C$). The objective, of course, is to reject this hypothesis (the null hypothesis) in favor of an alternative hypothesis (for example, $RECID_E < RECID_C$). These statistical tests are subject to two kinds of error:

1. Rejection of the null hypothesis when it is true (accepting the alternative hypothesis that $RECID_E < RECID_C$ when, in fact, $RECID_E = RECID_C$), the type I (α) error;
2. Accepting the null hypothesis when it is false (accepting $RECID_E = RECID_C$ when, in fact, $RECID_E < RECID_C$), the type II (β) error.

The probability of a type I error occurring is generally called the level of significance of the statistical test. Similarly, 1 minus the probability of a type II error is termed the power of the statistical test. The results of a statistical test can be accepted with the most confidence when the level of significance is low (e.g., $\alpha = 0.05$) and the power is high (e.g., $1 - \beta = 0.80$). For a given effect and sample size, however, these two measures vary together; a small probability of a type I error is accompanied by lower power or higher probability of a type II error.

For a given effect size and level of significance, increasing the sample size will increase the power.

Much research, including criminal justice research, has relied on setting the level of significance at some accepted level (e.g., $\alpha = 0.05$, implying a 0.05 probability of rejecting the null hypothesis when it is true) with too little regard given to the importance of a type II error (Cohen, 1977). This neglect is particularly troublesome when, as in the Sandhills evaluation, the expected effect (the difference in outcomes) is small but important from a decision making or policy perspective. If "too small" a sample is available, the power of the test will be low, which means the program will be erroneously determined ineffective. Cohen (1977) defines a "small" effect size as 0.20. Thus, if we define the expected differences in outcomes for the experimentals and internal controls to be small, accept the "standard" level of significance of 0.05, and want our statistical tests to be "powerful" at the 0.80 level, the required total sample size is 620 for the intra-facility comparisons, 310 experimentals plus 310 internal controls, and 310 external controls for the inter-facility comparison.[14] Given some attrition in our sample groups, ideally the sample sizes should have been larger than 310 for each group.

At the conclusion of enrollment, our samples consisted of 295 experimental, 296 internal control, and 236 external control group members. Further, of these enrollees, 232 experimentals, 218 internal controls, and 224 external controls had been released. Our effective sample sizes were 232 experimentals and 218 internal controls for the intra-facility comparison; 196 experimental/internal controls and 224 external controls for the inter-facility comparison. Given these sample sizes, an effect size of 0.20 and a significance level of $\alpha = 0.05$, the power of a one-tailed t-test is 0.64 and of a χ^2 test is 0.98, 0.96, 0.93, 0.91, and 0.89 for 1, 2, 3, 4, and 5 degrees of freedom, respectively (Cohen 1977).

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[14] This is the sample size required for a comparison of means using a t-test and a level of significance of $\alpha = 0.05$ (Cohen 1977).

3.4. *Methodological Approach for Data Analysis*

The experimental design for the evaluation supports the testing of the hypotheses posed by the theoretical model. Random assignment of subjects to the three evaluation groups increases confidence that any differences can be attributed to the VDS program. The analyses presented in this report characterize the study groups (Chapter 5), VDS program implementation, participation and success (Chapter 6), post-release employment (Chapter 7), and post-release recidivism (Chapter 9). Because we are primarily interested in post-release behavior, our analyses principally concern the released study participants. Results are reported for:

1. Inter-facility comparisons, and
2. Intra-facility comparisons.

The first comparisons are between the controls and experimentals at CMYC/SYC (the CE group) and the external control group at PYC and HYC (the PH group). These comparisons consider that both the experimentals and controls are receiving programs and services not available elsewhere within the NC prison system and attempt to control for the possibility of no difference in treatment of the groups within CMYC and SYC.[15] Alternatively, the inter-facility comparison is between CMYC/SYC groups and other NC prisons. These comparisons are for those individuals enrolled under the original experimental design. Thus, they were enrolled during the period June 3, 1983 through November 4, 1984. This 18-month period will be referred to as Phase I and individuals enrolled during this period will be considered members of the Phase I cohort.

The second comparisons are between the internal control group at CMYC/SYC (the C group) and the experimental group at CMYC/SYC (the E group). Thus, these comparisons are for those individuals enrolled under both the original and the modified experimental designs. They were enrolled under the original design during the period June 3, 1983 through Novem-

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[15] Many of the staff at CMYC and SYC "resented" giving priority for program assignment to randomly selected individuals (the experimental group members). Although random assignment is recognized as a nondiscriminatory method of assignment to limited services (Sechrest, White and Brown 1979), the case managers and instructors (who had "say" over enrollment in their programs) felt strongly that other criteria such as (1) perceived (by the case manager or instructor) probability of success or (2) "first-in" were more appropriate than the random assignment criteria.

ber 4, 1984 (the Phase I cohort of C's and E's) and under the modified design during the period November 5, 1984 through June 4, 1986 (the Phase II cohort of C's and E's).

3.5. Summary

The original experimental design was implemented in June 1983 with the initiation of enrollment of evaluation subjects. The original design was a true experimental design in that the subjects (inmates) selected for participation in the project were randomly assigned to either (1) a group which would *not* receive the VDS (the external control group), (2) a group which would receive *some* of the VDS program services (the internal control group), or (3) a group which would receive *all* VDS services (the experimental group). The basis for the original design was that if "comparable" subjects were randomly assigned to a "treatment" or a non-treatment" group then post-release employment and recidivism differences could be attributed to the treatment (the VDS program) rather than to some "unknown" external factors.

The implementation of an experimental design with an external control group, however, was compromised in 1984 by a decline in the number of youthful offenders entering the NC prison system. The decline in prison population resulted in a modified design that was implemented in November 1984. The modified design retained the basic elements of a true experimental design, that is, random assignment to either the experimental or internal control group, but eliminated the enrollment of additional external control group members. *A priori*, smaller differences in treatment were expected between the intra-facility groups than were expected between the inter-facility groups. Thus, the transition from the original to the modified design implied a decrease in power for the planned analyses. To address this problem, the enrollment period was extended in order to increase the sample size and, thus, increase the likelihood that differences (if present) could be detected statistically.

The necessity to modify the original evaluation design demonstrates the fragility of a "real world" experimental design while revealing key issues in experimental design implementation which are often overlooked in evaluation studies involving human subjects.

4.0 EVALUATION DATA

The Sandhills data bases were established using information collected specifically for the evaluation and from information available from the NC Department of Correction (DOC), the Employment Security Commission (ESC), and the Police Information Network (PIN). These data provide extensive information on each participant's pre-incarceration, incarceration, and post-release experiences, as well as socio-demographic information. Section 4.1 briefly describes the data collection instruments and procedures. All raw data were "uploaded" into Statistical Analysis System (*SAS*[R]) datasets. Section 4.2 addresses the issue of missing data. More extensive information on the data sets is provided in the Codebook submitted to NIJ with the data.

4.1 Data Collection

Data for the evaluation were collected from the following sources:

1. Sandhills Evaluation Project Resident Enrollment Form was used to acquire background information on those enrolled in the external control group.[16]
2. Sandhills Evaluation Project Inmate Follow-up Form was used to collect data on post-release criminal and labor market behavior of all study group members.
3. Sandhills management information system (MIS) at CMYC provided information on inmate history (analogous to that collected on the enrollment form described in 1 above) and prison experience (program participation) for members of the experimental and internal control groups.
4. Department of Correction Inmate Record Files were acquired to provide additional inmate history, in-prison experience and post-release (recidivism) information.

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[16] A Sandhills Evaluation Project Transfer Form was used early in the project to collect information on the prison experience (vocational training and other activities) of the external control group members. We were unable to achieve sufficient compliance with our requests for this information to provide a comprehensive file. Thus, this data collection instrument was dropped.

5. Department of Correction Probation Master Files were also acquired for information on post-release behavior including recidivism.
6. Employment Security Commission Wages and Claims Files were acquired for wage and unemployment insurance claims information.
7. Police Information Network Files were acquired for information on post-release criminal activities.

A detailed description of each source and the procedures for collecting information are provided below.

4.1.1 Enrollment Form

The Sandhills Evaluation Resident Enrollment Form was developed to collect background information on the members of the external control group. Collection of this information was completed in November 1984, when enrollment of the external control group ended. The collected information included general descriptive information (e.g., crime code for current offense, health grade, and IQ) as well as information (e.g., job title, industry, and wages) on the most recent three jobs held by the inmate prior to incarceration for the current offense. This form was completed for all members of the external control group by personnel (case manager or analyst) at PYC and HYC each week after the randomization procedures (applied to the list of those eligible for transfer to CMYC) identified members of the external control group. A copy of the enrollment form is included in the Codebook.

4.1.2 Follow-up Forms

The evaluation follow-up forms were completed by either (1) DOC Division of Adult Probation and Parole parole officers or (2) ESC offender specialists. The parole officers collected follow-up information on all project participants (experimental, internal control, and external control) who were on parole during the first 6 months following inmate release from prison. The ESC offender specialists collected this information on all individuals who were not on parole during the 6 months immediately following release. These forms were designed primarily to collect employment information (e.g., type of job, wages, level of job satisfaction), although supplemental information (e.g., number of dependents) was also requested. Two

follow-up forms were used during the evaluation. (Copies are included in the Codebook.) The original follow-up form was used during the period February 1984 through March 1985; a revised form was developed and distributed in April 1985. Information was originally collected at 30-, 60-, 90-, and 180-days post release. In April 1985, the 60-day follow-up was eliminated to reduce the demands on the "volunteer" data collectors. Additionally, the original form was revised to (1) better organize the questions to facilitate completion by the DAPP or ESC personnel; (2) eliminate some questions for which responses had not been forthcoming; and (3) add several questions (questions pertaining to additional jobs).

Requests for follow-up information and a copy of the follow-up form were sent directly to either the participant's parole officer (if the individual was on parole) or the ESC offender specialist in the appropriate geographic region (if the individual was not on parole). These requests were mailed by employees of the Department of Correction. about 2 weeks prior to the review date (1-month, 3-months or 6-months post-release),

Collection of primary source follow-up data to provide detail on the post-release activities of the released offenders was viewed as a strength of the experimental design. However, follow-up data on all released subjects were not forthcoming. We obtained one or more forms on only 417 of the 674 released subjects. We were more likely to have information on released experimentals (69 percent) and external controls (68 percent) than on internal controls (50 percent). Additionally, we were more likely to have information on those paroled (60 percent) or conditionally released (76 percent) than on those unconditionally discharged (46 percent). The reasons for the variability in response by group and by type of release are unknown. We believe that reliance on "volunteers" to collect these data may have contributed to this result. By volunteers, we mean individuals (parole officers or offender specialists) who had been assigned to collect this information in addition to their other duties.[17] It appears that parole officers were more successful in locating and reporting on our subjects than were the offender

[17] Requests for information went to parole officers if the subject was released on parole and to offender specialists if the subject was conditionally released or discharged. The offender specialists were also forwarded requests for follow-up information on those whose parole terminated prior to 6 months following release.

specialists. Additionally, the ESC offender specialists, who were assigned to work with experimental group members both before and after their release from prison, were probably more successful in locating experimentals than internal or external control group members.

4.1.3 Sandhills Management Information System

The Sandhills Management Information System was established, concurrent with initiation of the evaluation, as a computerized case management system for the staffs of CMYC and SYC.[18] The Department of Correction agreed to provide the following information from their system for the evaluation:

1. Enrollment information, including group designation, current sentence and background;
2. Information on the inmate's employment history and, at time of release, the planned post-release job and address of the inmate.
3. Correctional Plan data, including the educational, vocational, and other activities scheduled for, attempted and completed by the individual.

As the staffs of CMYC and SYC routinely used the data from the computerized file, it was hoped that incorrect entries would be corrected, assuring that the data acquired for the evaluation were highly accurate and complete. In fact, use of the management information system met with considerable resistance at the two facilities. Rather than a tool that would assist them in the performance of their routine duties, some personnel at the facilities regarded providing information for the system as an additional duty. Thus, at least during the early stages of the evaluation, the accuracy of the data is most likely variable. Overall, however, it is our belief that the data acquired from this system is reliable to the extent that errors are not correlated with study group.

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[18] The MIS was originally developed and operated using a Univac computer at Sandhills Community College. The needs of the case management system proved to be greater than could be fulfilled routinely by the College and location of the computer some 30 miles from the prisons proved inconvenient. Dr. Gary Gottfredson, working under an NIJ grant to develop implementation standards for the VDS program, adapted the management information system to a micro-computer which was installed at CMYC in late 1985.

We received data from this system in early July 1986. Requests for updates of the data files in late 1986 were not met. The MIS "crashed" in February 1987 and, according to administrators at CMYC, will no longer be used. Calls to CMYC finally revealed the system failure in March 1987. A trip was made to the facility in an effort to determine whether any data were recoverable; a back-up of the hard-drive files was obtained. Efforts to recover data from this back-up were successful for information contained in the "Resident File." This information includes subject information, as well as information on rule violations, and background. The program participation or "Activity" data on this back-up were not recoverable.[19] Thus, our study of program participation and completion (Chapter 6) will be limited to the three-year period June 1983 through June 1986. (Some educational program information is available in the DOC Inmate Record Files and this information was analyzed for the entire evaluation period; see section 6.3.)

4.1.4 DOC Inmate Record Master File

The DOC provided tapes containing Inmate Record Master files for all study participants. The inmate record file contains extensive information on all individuals who have been incarcerated in North Carolina's state prisons. These records were provided in response to our submittal of DOC identification numbers for our subjects. We were able to identify correct DOC numbers for 815 of our 827 subjects.[20] The final data sets were obtained from the DOC May 20, 1987.

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[19] An additional back-up of these data exists; we are continuing our efforts to acquire these data from CMYC.

[20] A discussion with DOC personnel revealed that often the DOCN assigned to an individual at arrival is incorrect and is subsequently changed, thus some of our numbers (gathered at the time individuals are enrolled in the study which is shortly after arrival) were incorrect. We were able to search the DOC's "log" of inmates and correct all but 12 of the numbers incorrectly provided on the enrollment form or the Sandhills MIS data file. We were unable to identify the correct number for 12 subjects.

4.1.5 DOC Probation Master Files

The computer files for the Division of Adult Probation and Parole provide a source of information on post-release behavior, particularly recidivism. Data accessed from this file included recidivism indicators and behavioral information. Probation records were obtained from the DOC May 20, 1987. These data are for all released inmates who were paroled at release and for whom we had correct DOC numbers.

4.1.6 ESC Wages and Claims Files

The Employment Security Commission provided wage and unemployment insurance claims information on the study participants. The ESC keeps quarterly information on all individuals working in North Carolina who are covered by unemployment insurance. The most recent five quarters of wage information are kept, with data entry "lagging" by about one quarter. Social security numbers were required to access this data. The final data were acquired in August 1987. For the final submission, we had social security numbers for 683 of our 827 subjects. Wage information was received for 533 of the 683 subjects. Those with no match either had no recent wages reported to ESC or, most likely for some individuals, the social security number we had was incorrect. The ESC files provided information on the post-release employment behavior of the study subjects (Chapter 7).

4.1.7 Police Information Network Files

The Police Information Network (PIN) Files provide arrest and conviction information from the 50 states. These files were important in studying the post-release criminal behavior of the study participants (Chapter 8). The final data from PIN were acquired in August 1987. To access these files, we needed the FBI numbers of the study participants. Our source for this information was the DOC Inmate Master Record Files. Numbers were available for all but 91 of our subjects. There was no match for 18 of the numbers submitted to PIN.

4.2 Available and Missing Data

Despite limitations, we were able to acquire considerable information on our subjects. The total enrollment in the evaluation was 827 subjects; of the total, 674 were released by late May 1987. The following list summarizes the available information.

1. Enrollment information was available for all subjects.
2. Activity data, current through July 1986, were available for 589 of the 591 experimental and internal control group members.
3. Primary source follow-up data were acquired for 418 released subjects.
4. DOC Inmate records were acquired for 815 subjects, May 1987.
5. DOC Probation records were acquired for 554 subjects, May 1987.
6. PIN records were acquired for 718 subjects, August 1987.
7. ESC wage information was acquired for 533 subjects, August 1987.

As was noted throughout the previous section, we were unable to obtain information from all sources for all evaluation subjects, chiefly because identification numbers (DOC, Social Security, or FBI) were either not available or did not generate a match. Specifically, we have the following "gaps" in our databases:

1. No primary source follow-up data for 256 of the 674 released subjects;
2. No DOC data (Inmate files and Probation records) for 12 subjects;
3. No ESC data for 260 of the 674 released participants;
4. No PIN data for 85 of the 674 released participants.

With the exception of the primary source follow-up data, we have no reason to expect that missing data are correlated with our subject groups. Thus, analyses of these data should not be biased by the missing information.

5.0 Characterization of Evaluation Subjects

This Chapter describes the subjects who were enrolled in the experimental, internal control, and external control groups. The groups are compared on a variety of demographic, pre-incarceration employment, and criminal history measures. As described in Chapter 3, the first stage of randomization assigned 18-to-21-year-old property offenders (felons) to either the Polk/Harnett external control group or to CMYC. At CMYC, selection criteria were applied to the subjects and those deemed amenable to the VDS program were randomly assigned to either the experimental (VDS participant) group or the internal control group. A total of 827 subjects were enrolled of which 295 were experimentals, 296 were internal controls, and 236 were external controls. The external control group was identified under the original experimental design during the period June 3, 1983 through November 4, 1984; this period is designated Phase I of the evaluation. Random assignment of inmates to the experimental and internal control groups also began June 3, 1984, but continued through June 1, 1986. The period November 5, 1984, through June 1, 1986, is designated Phase II; Phase II enrollments included only experimentals and internal control group members.

The purpose of the analyses presented in this chapter is two-fold. First, comparison of the inter- and intra-facility groups provides an indication of whether the randomization procedures specified by the experimental design were followed. If the procedures were followed, we should observe few differences in the characteristics of the groups. Secondly, if there are systematic differences in the groups, these factors should be controlled in subsequent analyses of program participation and post-release behavior.

The analyses presented in this chapter are for **the subset of the study population which was released on or before May 20, 1987.** This group includes 82 percent of the enrollment population (674 releasees of 826 enrollees). The analyses were also conducted for the entire enrollment population and the results were similar; any discrepancies between the test statistics for the released and enrolled comparisons are noted in the text.

The remainder of the chapter presents the results. Section 5.1 compares the CMYC/SYC groups (experimentals and internal controls) with the Polk/Harnett external control group. This comparison is for subjects enrolled during Phase I of the project when the two stages of randomization were in effect. These analyses describe the subjects for subsequent inter-facility comparisons of program participation and post-release behavior. Section 5.2 compares the experimental group subjects with the internal control subjects. These analysis provide a description of the subjects for subsequent intra-facility comparisons of program participation and post-release behavior.

5.1 Inter-Facility Study Group Comparisons

As previously noted, the first stage of randomization (referred to as Phase I of the study) assigned individuals to either the Polk/Harnett external control group or to CMYC/SYC for subsequent assignment to either the experimental or internal control group. During Phase I, 460 subjects were enrolled in the study; 224 were assigned to the external control group (Polk/Harnett or PH group) and 236 to the CMYC/SYC (controls/experimentals or CE group). As of May 20, 1987, 224 members of the PH group and 196 members of the CE group had been released.

In this section, we provide a description of the Phase I releasees. Results of the comparisons of the characteristics of the released internal control/experimental (CE) group members and the released external control (PH) group members are summarized in Tables 5.1, 5.2, and 5.3. The null hypothesis for each test was that there was no difference in the two groups; the alternative hypothesis was that the two groups differed on the measure (implying a two-tailed

test for the continuous variables). The significance level for all tests was set at $\alpha = 0.05$; differences significant at the $\alpha = 0.10$ level are noted in the text. For the most part, the results for the Phase I releasees are the same as those for the Phase I enrollees; any differences in significance are noted.

As can be seen in Tables 5.1 and 5.2, the groups are indistinguishable on a variety of socio-demographic and employment history variables. The two groups were not significantly different in terms of race (**RACE**), IQ (**BETAIQ**), WRAT achievement test scores (**WRATMATH, WRATREAD, WRATSPEL**), and highest grade completed at the time of conviction (**EDUCACON**). About 49 percent of each group is black, 48 percent is white, and 3 percent is American Indian. The CE group's mean IQ of 98.8 is not significantly different from the PH group's mean IQ of 98.7. The CE group's mean WRAT scores (grade level) in arithmetic, reading and spelling are 5.1, 5.3, and 6.1, respectively; these means are not significantly different from the PH group's mean **WRATMATH** (5.0), **WRATREAD** (6.3), and **WRATSPEL** (5.5). Educational achievement at the time of incarceration is also similar for the two groups. The values of **EDUC** ranged from a low of 6 to a high of 13. Fifty-eight percent of the CE group and 54 percent of the PH group had completed 9 or less years of school. The overall mean for completed grade level was 9.3 years.

The CE group members were more likely to be unmarried (single, separated, or divorced) than were members of the PH group (89% versus 80%); few, but comparable numbers, had children (16 percent of the CE group, 19 percent of the PH group). Data were also available to compare some aspects of the subjects' family and environmental backgrounds. The socio-economic backgrounds and status at incarceration were not significantly different for the two groups. Seventy percent of the CE group and 62 percent of the PH group were from families with subsistance or poverty level income (**ECONFAM**); 87 percent of the CE group and 89 percent of the PH group categorized their socio-economic status at incarceration as subsistence or poverty level (**ECONCUR**). Sixty-seven percent of both groups were living in an urban area (**URBAN**) prior to incarceration.

Table 5.1. Socio-Demographic Comparisons for Phase I Releasees

Variable	Description	No. CE	No. PH	Test Statistic	df
χ^2					
DEPEND	No. of children	169	193	1.238	2
DRUGS	Drug use	171	193	3.288	2
DRUNK	Alcohol use	171	193	2.531	2
EDUC	Grade level	195	222	1.213	6
ECONFAM	Family socio-econ. status	171	193	2.340	2
ECONCUR	Current socio-econ.status	171	193	3.434	2
MARITAL	Married/not married	196	222	5.897[1]	1
MENTAL	Mental health problems/not	170	193	2.191	1
RACE	White/nonwhite	196	223	2.147	1
URBAN	Urban/rural residence	170	192	0.007	1
t-tests					
AGEIN	Age at enrollment	193	223	2.4620[1]	414
AGEOUT	Age at release	196	223	3.6109[1]	305.6
BETAIQ	Beta IQ score	196	223	0.1439	417
WRATMATH	WRAT arithmetic score	196	223	0.8708	415.5
WRATREAD	WRAT reading score	196	223	-0.6147	417
WRATSPEL	WRAT spelling score	196	223	-0.7073	417

1 indicates significance at the $\alpha = 0.05$ level.
2 indicates significance at the $\alpha = 0.10$ level.

The CE group was slightly older at the time of enrollment into the study than the PH group (mean age of 19.9 years versus 19.7 years, respectively). This small, though statistically significant difference, is most likely due to the timing of the enrollment procedures. Those designated members of the external control group were immediately enrolled into the evaluation, while those designated for transfer to CMYC were not enrolled until after they had reached this facility. Members of the CE group were also, on average, older when released than were members of the PH group (means of 21.2 years and 20.6 years respectively).

Members of both groups were equally likely to have reported mental health (**MENTAL**), drug (**DRUGS**), and alcohol (**DRUNK**) problems at the time of incarceration. Seven percent of the PH group and 12 percent of the CE group reported mental health problems. Forty percent of each group reported frequent use of drugs (**DRUGS**); the drug used was marijuana for 60 percent. Frequent alcohol use was reported by 39 percent of the CE group and 37 percent of the PH group.

Table 5.2. Employment History Comparisons for Phase I Releasees

Variable	Description	No. CE	No. PH	Test Statistic	df
χ^2					
ESTATUS	Employment at arrest.	122	224	9.447[1]	3
EXP	Years work experience	193	215	4.289	6
IND	Industry of last job	123	181	5.210	6
OCC	Occupational classification	196	222	11.577	11
WORKHIST	Work history stability	167	197	0.900	2
t-tests					
BHOURS	Hours/week last job	120	180	-0.4333	298
BWAGE	Hourly wage last job	123	181	0.0197	302
PAY	Weekly wages	196	222	-0.2730	416

1 indicates significance at the $\alpha = 0.05$ level.
2 indicates significance at the $\alpha = 0.10$ level.

Summarizing the results thus far, we can characterize the "typical" Phase I subject as follows: He is single with no children and is from an urban, poverty/subsistance level environment. He is equally likely to be white or black. Further, he is of average intelligence and has completed about 9 years of school. He is unlikely to have mental health problems and is not a frequent user of drugs or alcohol.

Table 5.2 summarizes the comparison of employment history information. The groups differed only with respect to their employment status at the time of arrest (**ESTATUS**); values for this variable were: employed full time, employed part time, unemployed, and student. About equal proportions of each group were employed part and full time, but a larger proportion of the CE group was unemployed (47 versus 37 percent) and a larger proportion of the PH group was in school (students; 9 versus 2 percent). The variables **BWAGE, BHOURS**, and **IND** refer to the hourly wage, number of hours worked per week, and industry of the last job prior to incarceration. There was no difference between the two groups on any of these measures. The average hourly wage earned by both groups was $4.35 and the average number of hours worked per week was 38. The proportions of each group working in various industries were also similar. Most were employed in construction (38 percent of the CE group; 34 percent of the PH group) or manufacturing (21 percent of the CE group; 22 percent of the PH group). The

Table 5.3. Criminality Measures Comparisons for Phase I Releasees

Variable	Description	No. CE	No. PH	Test Statistic	df
χ^2					
ALKDRUGS	Alcohol/drug use at offense	171	193	4.925	3
CRIME	Indicator of crime type	196	224	11.822[2]	6
CYORYO	Offender type	196	224	7.328[1]	1
NONC	No. previous NC sentences	184	212	5.858	3
NORULE	No. rule violations	196	222	9.644[1]	4
RELHOW	Type of release	196	222	12.745[1]	2
TOTSENT	No. of sentences	190	218	20.695[1]	4
t-tests					
SENT	Sentence length	196	222	9.6351[1]	328.5
TIMESVD	Time served	196	222	9.9895[1]	353.2

1 indicates significance at the $\alpha = 0.05$ level.
2 indicates significance at the $\alpha = 0.10$ level.

data for variable **PAY** is from the DOC Inmate files; values are the reported weekly wage prior to incarceration. Again, there was no difference between the two groups. The mean values were $97.39 for the CE group and $99.68 for the PH group. The final employment history variables we consider are total work experience (**EXP**), occupational classification (**OCC**), and employment record stability (**WORKHIST**). Most members of both groups had less than 1 year of work experience (58 percent of the CE group; 56 percent of the PH group) and were "unskilled" (**OCC**; 61 percent of the CE group; 54 percent of the PH group). Thirteen percent of the CE group and 15 percent of the PH group had no work history (**WORKHIST**), while 60 and 52 percent of the CE group and PH group, respectively, reported unstable work histories.

Thus, the two groups have essentially identical employment histories. The "typical" subject has less than one year of work experience in an unskilled occupation in construction or manufacturing. His last job prior to incarceration was full time (38 hours/week) and he was working for "low" wages ($4.35/hour).

The groups were compared on one measure of criminal history (**NONC**), five measures of criminality related to the current imprisonment (**CYORYO, CRIME, TOTSENT, SENT,**

ALKDRUGS), one measure pertaining to in-prison conduct (**NORULE**), and two measures pertaining to release (**TIMESVD, RELHOW**). The results of these analyses are presented in Table 5.3. The groups were similar in terms of the number of previous (to the current incarceration) sentences to NC prisons (**NONC**); the enrollment sentence was the first NC sentence for 60 percent of the CE group and 70 percent of the PH group.[21] The CE and PH groups differed in terms of offender type (committed youthful offender or regular youthful offender, **CYORYO**); 42 percent of the CE's and 56 percent of the PH's were CYO's. The variable **CRIME** is a categorical variable which reduces NC crime codes to eight categories (e.g., robbery, auto theft, breaking and entering; note that all evaluation subjects are property offenders); a χ^2 analysis revealed that the two groups were statistically indistinguishable on this measure (the χ^2 statistic is significant at the $\alpha = 0.10$ level).[22] Most members of both groups were "serving time" for breaking and entering or breaking, entering and larceny (66 percent of the CE group and 76 percent of the PH group).

The groups differ with respect to the number of sentences (**TOTSENT**) and the length of sentence (**SENT**) for the enrollment incarceration. Specifically, members of the CE group were more likely than the members of the PH group to be serving more than one sentence (67 percent of the CE's were serving more than one sentence versus 49 percent of the PH group). The CE group was serving a longer sentence, on average, than the PH group (65 months versus 40.3 months). Forty-two percent of the CE group and 48 percent of the PH group were not under the influence of drugs or alcohol (**ALKDRUGS**) when they committed the crime that led to their enrollment incarceration.

These results strongly suggest that our experimental and external control group are quite different with respect to the severity of their criminal histories. All differences suggest, in some way, that the experimental group is "worse" in terms of criminality than the external control group. The reasons for this assessment are as follows:

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[21] The χ^2 statistic for the comparison of NONC for all Phase I enrollees was significant at the $\alpha = 0.10$ level.

[22] The χ^2 statistic for the comparison of CRIME for all Phase I enrollees was significant at the $\alpha = 0.05$ level. The χ^2_6 test statistic was 13.995.

1. Committed youthful offender (CYO) is a special adjudication status that allows youthful offenders to be released earlier than would occur if sentencing was made under North Carolina's Fair Sentencing Act. It seems reasonable to expect that judges would confer CYO status on those whose criminal background and/or current crime is less serious. A significantly larger percentage of the PH group than the CE group was composed of CYO's.
2. Members of the CE group were serving more sentences, on average, than members of the PH group. Again, this suggests a more serious participation in crime by the CE group members.
3. The sentences being served by the CE group were, on average, significantly longer than those being served by the PH group. The difference in the mean sentences was more than two years. Sentence length in often used as a proxy for severity of offense, with longer sentences implying more serious crimes.

Although these differences in criminal history could be due to chance, it is more likely that they are attributable to the selection criteria applied during screening at CMYC (see section 3.3). Specifically, one result of the length-of-stay (sentence length) criterion was to exclude from the CMYC group of amenables those with short sentences, leaving those with longer sentences to comprise the two CMYC/SYC study groups. Thus, the experimental design is "responsible" for these differences and, in fact, the differences suggest that selection procedures were followed.

The original evaluation design included provisions to "statistically screen" for the amenability selection criteria by retrospectively dropping those PH group members who did not meet these criteria. In anticipation of this step, we identified the number of subjects in all groups who met the "objective" (i.e., sentence length) criteria and found that 58 percent of the CE group and 49 percent of the PH group had sentence lengths commensurate with the sentence length criterion.[23] Thus, screening by the sentence length criterion would eliminate approximately half of the Phase I subjects. Additionally, we found that the screening would result in a PH group which had significantly more RYO's than the CE group. Further, because the distribution of sentence lengths differed significantly for the two groups, the mean sentence length of the PH group would still be significantly less than that of the CE group (49.8 months versus 65.5 months).

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[23] Discussions with the personnel who screened and enrolled subjects at CMYC revealed that they adhered to the sentence length criterion as a "back up" and relied on their own experience on a case-by-case basis to estimate whether an inmate would meet the length-of-stay criterion of 8 months to 3 years.

Since we were unable to stratify the groups to achieve comparable criminal characteristics and the Phase I CE and PH groups are comparable on socio-demographic and employment variables, we chose to retain the complete PH group for the inter-facility analyses. The following points are pertinent to this decision.

1. The PH group is not technically a control group, but is a "good" comparison group. Henceforth in this report, the PH group will be designated the **external comparison group.**
2. We will "control" statistically for differences in sentence length where the analytical methods allow. When we can't control for these variables, the results should be interpreted in concert with the recognition that the CE group differs from (is "worse than") the PH group in terms of criminal history.

The final comparisons we will discuss are number of rule violations while in prison for the enrollment sentence (**NORULE**), the length of time served (**TIMESVD**), and the type of release (**RELHOW**). There was a significant difference between the two groups on each of these three measures. Members of the CE group were much more likely to have rule violations than were members of the PH group (76 percent of the CE group had one or more rule violations compared with 64 percent of the PH group; additionally, 35 percent of the CE group had 4 or more rule violations compared with 26 percent of the PH group). The average incarceration period served by the CE group was almost a year longer than that served by the PH group (731.9 days versus 404.2 days); this result is not surprising since the average CE sentence was two years longer than the average PH sentence. Members of the PH group were "about equally likely" to have been conditionally released (30 percent), paroled (46 percent), or unconditionally discharged (24 percent). Members of the CE group, on the other hand, were more likely to have been paroled (64 percent) than conditionally released (19 percent) or unconditionally discharged (17 percent).

The following section presents the results of the comparisons of the experimental and internal control group.

5.2 *Intra-Facility Group Comparisons*

This section describes the subjects who comprised the experimental and internal control groups. Subjects were compared on the basis of socio-economic, pre-incarceration employment and criminality variables. These intra-facility group comparisons examine the subjects at CMYC/SYC who were randomly assigned to either the experimental group or the internal control group. Enrollment of these participants began June 3, 1983, and ceased on June 4, 1986. The total number enrolled in the VDS project was 591; 295 were experimentals (E's) and 296 were internal controls (C's). As of May 20, 1987, 450 members of these two groups had been released (232 E's and 218 C's). The results in this section are for these released subjects. (The results for equivalent analyses for the complete enrollment were identical to those presented here in terms of the significance of the test statistics.) The null hypothesis for each test was that there was no difference in the two groups; the alternative hypothesis was that the two groups differed on the measure (implying a two-tailed test for the continuous variables). The significance level for all tests was set at $\alpha = 0.05$; differences significant at the $\alpha = 0.10$ level are noted in the text. Summaries of the analyses are presented in Tables 5.4, 5.5, and 5.6. As can be seen the two groups differed only with respect to three of the socio-economic variables--**DRUNK, URBAN,** and **WRATMATH.**

As there was no difference in these two groups, we will present a single profile of these subjects. The "typical" CMYC/SYC study participant is single with no children, white, and from an urban area. He has a poverty/subsistance level background and an IQ of 100. He was 20 years of age when enrolled in the study, had completed the ninth grade, and scored at the 5th or 6th grade level on the WRAT tests of reading, spelling, and mathematical skills. He was most likely employed when he was arrested for the crime which sent him to prison, working in either construction or manufacturing for a wage of $4.67 an hour. He has had less than a year of work experience and is unskilled. He was sentenced to five years for breaking and entering and was paroled after serving slightly less than 2 years. The enrollment incarceration was his first in NC prisons.

Table 5.4. Socio-Demographic Comparisons for CMYC/SYC Releasees

Variable	Description	No. E	No. C	Test Statistic	df
χ^2					
DEPEND	No. of children	214	187	0.003	1
DRUGS	Drug use	216	188	3.151	2
DRUNK	Alcohol use	216	188	7.585[1]	2
EDUC	Grade level	232	218	2.843	7
ECONFAM	Family socio-econ. status	214	188	0.773	2
ECONCUR	Current socio-econ.status	216	188	2.735	2
MARITAL	Married/not married	232	218	0.135	1
MENTAL	Mental health problems/not	216	187	0.395	1
RACE	White/nonwhite	232	218	0.001	1
URBAN	Urban/rural residence	215	188	3.905[1]	1
t-tests					
AGEIN	Age at enrollment	227	215	0.6749	440
AGEOUT	Age at release	229	216	-0.4071	437.8
BETAIQ	Beta IQ score	229	217	-0.7045	444
WRATMATH	WRAT arithmetic score	224	216	2.2081[1]	438
WRATREAD	WRAT reading score	224	216	0.9045	438
WRATSPEL	WRAT spelling score	224	216	0.5100	438

1 indicates significance at the $\alpha = 0.05$ level.
2 indicates significance at the $\alpha = 0.10$ level.

If the "typical" participant was a member of the experimental group he was more likely than a control group member to be a frequent user of alcohol and to be from an urban area. Additionally, he would have scored better on the WRAT arithmetic achievement test.

The results show that the released experimentals and internal controls are indistinguishable on a variety of socio-demographic, employment history, and criminality measures. This suggests, within the limits of a Type I error, that the randomization procedures were followed and, thus, that the experimental design with respect to subject selection was correctly implemented. Subsequently, we can have confidence that differences in program participation or post-release behavior by the two groups are due to the VDS program, rather than to differentiable characteristics of the two groups.

Table 5.5. Employment History Comparisons for CMYC/SYC Releasees

Variable	Description	No. E	No. C	Test Statistic	df
χ^2					
ESTATUS	Employment at arrest.	194	88	2.311	2
EXP	Years work experience	232	218	6.924	6
IND	Industry of last job	224	133	3.683	5
OCC	Occupational classification	214	188	3.030	4
WORKHIST	Work history stability	215	187	1.634	2
t-tests					
BHOURS	Hours/week last job	174	93	-1.0671	158.5
BWAGE	Hourly wage last job	177	93	0.0454	268
PAY	Weekly wages	232	218	1.15100	448

1 indicates significance at the $\alpha = 0.05$ level.
2 indicates significance at the $\alpha = 0.10$ level.

5.3 *Summary*

This Chapter presented the results of a series of analyses conducted to compare the subjects of the three evaluation groups. These analyses served to characterize our evaluation population and to provide a check on the implementation of our experimental design. Specifically, few significant differences in subject characteristics would suggest that the randomization procedures were upheld and, therefore, that the integrity of the experimental design (enrollment) was maintained. Conversely, if the study groups proved to be "very different," this could imply that the experimental design had been compromised.

The subjects were compared on a variety of demographic, pre-incarceration employment, and criminal record measures. Two sets of results were presented. The first set was for the released Phase I subjects, the subjects of the inter-facility comparisons presented in the following Chapters. These two groups were designated the PH and CE groups. The second set was for the released experimental and internal control groups; the E and C groups are the subjects of the intra-facility comparisons which follow in subsequent Chapters. Thus, we

Table 5.6. Criminality Measures Comparisons for CMYC/SYC Releasees

Variable	Description	No. E	No. C	Test Statistic	df
χ^2					
ALKDRUGS	Alcohol/drug use at offense	214	188	4.462	3
CRIME	Indicator of crime type	232	218	5.950	6
CYORYO	Offender type	231	217	0.007	1
NONC	No. previous NC sentences	232	217	0.964	3
NORULE	No. rule violations	232	218	7.104	4
RELHOW	Type of release	232	218	2.699	2
TOTSENT	No. of sentences	232	218	3.025	4
t-tests					
SENT	Sentence length	232	218	-1.3503	409.8
TIMESVD	Time served	232	218	−1.7714[2]	448

1 indicates significance at the $\alpha = 0.05$ level.
2 indicates significance at the $\alpha = 0.10$ level.

conducted two sets of analyses (inter- and intra-facility) for four study groups (CE versus PH, C versus E).

Overall, the groups compared "well" (there were few differences between them) with respect to the demographic and pre-incarceration employment measures. The following list profiles our subjects:

1. About half of each group was white.
2. About 70 percent of each group was from a poverty/subsistance level background.
3. Most subjects (80-plus percent) drink and use drugs at least occasionally, though few are frequent users.
4. Most of the subjects were not married, although a significantly greater number of the PH group was married.
5. The majority of subjects were from urban, as opposed to rural, areas.
6. The subjects' IQ's were approximately 100, i.e. "average."

The following aspects of the group characterizations are particularly relevant to the VDS objective of improving post-release employment:

1. The average educational achievement for all groups was ninth grade; only about 10 percent of the subjects had completed the twelfth grade. Additionally, most subjects tested at the fifth or sixth grade level.

2. Fifty-seven percent of the subjects had less than one year of work experience.
3. More than 70 percent were classified as "unskilled" with respect to occupation.
4. Most (70-plus percent) had either no or unstable work histories.

The examination of criminal backgrounds revealed that there were significant differences between the PH and CE groups but that the C and E groups were equivalent on all measures. The differences in the criminal backgrounds of the PH group and the CE group were attributed to the selection criteria which were imposed at the second stage of randomization at CMYC. More specifically, these differences derived from the efforts at CMYC to eliminate from the VDS project inmates who would not be in prison long enough to receive all of the VDS services. The initial screening criteria proved to be more rigorous than necessary (see Chapter 3) but were in place for most of Phase I of the project. The result is that the PH group is more properly a **comparison group** than a control group, where "control" refers to a group identified by an identical random process. Thus, henceforth in this report, the PH group will be referred to as the external comparison group. The following list summarizes the criminal histories of the study groups:

1. Most members of all groups were serving sentences for breaking and entering or breaking, entering and larceny.
2. The average sentence for the PH group was 40 months compared with an average sentence of 65 months for the CE group (the C's and E's had average sentences of 62 months).
3. C's and E's (and the CE's) were more likely to be incarcerated with more than one sentence than were the PH's.
4. A majority of each group was incarcerated for the first time.
5. The CE group served an average of 730 days compared with 404 days served, on average, by the PH group. The C's and E's, which included the CE group and those enrolled after November 1984, served an average of 580 days.

6.0 Program Delivery

The ultimate goal of the VDS program is to reduce recidivism. As described in Chapter 2, the VDS program is based on an economic model of criminal behavior. Reduced recidivism is hypothesized to be contingent upon an inmate successfully completing programs which will enhance their ability to obtain post-release employment. The underlying hypotheses are the following:

1. The VDS improves job skills.
2. Improved job skills, in turn, lead to a more satisfying or better-paying job.
3. The "better" job, providing an alternative to crime, leads to a reduction in recidivism.

The VDS program evaluation is based on a true experimental design (see Chapter 3). A randomly selected experimental group was designated to receive all VDS services, while a randomly selected internal control group was designated to receive VDS services on an "as available" basis.[24] A third study group, the external comparison group, was composed of individuals who were to be confined in prisons other than CMYC and SYC and, who, therefore, received no VDS services. (All North Carolina youth prisons offer vocational, academic, work, and enrichment programs to their inmates. Thus, inmates in other facilities may have received some programs and services. No other prison, however, has integrated their programs as is done by the VDS program.) The experimental and internal control group comprise the subjects for **intra-facility comparisons**. At issue with respect to the intra-facility comparison

[24] The internal control group received services as they would be routinely received by an inmate in the facilities. The VDS program and its evaluation were not designed to deny available services to any inmate at CMYC or SYC. All services provided by the integrated VDS program were available prior to the initiation of the evaluation. All services were not, however, provided to all inmates. Thus, some inmates received evaluation, some vocational training, and some were assisted with post-release job placement. The evaluation sought to take advantage of a shortage of resources by randomly determining who would receive the limited services.

is not only whether the experimental group received the prescribed VDS services, but also whether the services they received were appreciably greater than those received by the internal control group. The comparisons of the two groups at CMYC/SYC (the experimental and internal control groups) with the external comparison group are designated **inter-facility comparisons**. The inter-facility comparison addresses whether those inmates who received at least some VDS services (the experimental and internal control groups) completed more vocational training than those who were not exposed to any elements of the VDS program (the external comparison group).

This chapter focuses on the first phase in the conceptual model which links the VDS program implementation with improvement in job skills. To establish this link, two questions are addressed:

1. First, was the VDS program implemented successfully? This question involves not only the delivery of services to the experimental group, but also the difference(s) in services received by the experimental and the control groups. These issues of treatment integrity are addressed in Section 6.1.
2. Second, did the VDS program result in an appreciable increase in the participants' vocational skill levels? This question addresses whether VDS participants completed more programs and successfully completed more programs that the internal control group and the external comparison group. Section 6.2 presents the intra-facility comparisons; section 6.3 presents the inter-facility comparisons.

6.1 Treatment Integrity: Implementation of the VDS

Few previous studies of the effectiveness of rehabilitive programs for offenders have examined whether or how well a program was implemented (see, for example, Sechrest, White and Brown, 1979). Reviews of these studies found that documentation on treatment was generally not available and when it was available that most often either the program was never implemented or was so poorly implemented that any expectation of effectiveness was misplaced.[25]

[25] For example, Kassebaum *et al*, (1971) conducted one of the most widely cited studies of a rehabilitation program which "failed." They used a true experimental design to evaluate the effectiveness of group psychotherapy in rehabilitation. In a subsequent article, Quay (1977) pointed out that the "failure" of this program may be attributable to one or more of the following: the nature of the counselling was not well defined, the counsellors were poorly trained, and neither the counsellors nor the participants regarded the treatment as meaningful.

The seriousness of the issue of treatment integrity was summarized by Sechrest, White and Brown (1979, p. 37) as follows: "The weakest link in the attempt to establish a causal chain relating programs to outcomes is evidence bearing on the integrity with which programs have been implemented." These findings suggest that every effort should be made to clearly identify the elements of the rehabilitative program and to assure that the elements are implemented. Further, these findings suggest that program delivery should be measured so that evaluation results can be interpreted within the framework of the program that was actually delivered.

Our early experience with the implementation of the Sandhills VDS program provides additional impetus to the study of program implementation. Specifically, two results were rapidly forthcoming following the initial efforts to implement the VDS. First, some of the individual program elements, assumed to be operational within the two facilities, were not being conducted (for example, correctional plans were not being updated). Secondly, integrating existing program elements required an extensive (4-to-6 month) start-up period. These early findings led to considerable effort by the administration and staff of CMYC and SYC and by ESC personnel to implement the VDS, and continual improvement in the program resulted.[28]

One of the major strengths of the VDS evaluation is the extent to which the issue of treatment integrity was addressed. The Sandhills VDS program was thoroughly characterized, standards for the delivery of program elements were developed, and detailed information on participation in the elements of the program were obtained for individual subjects. Thus, prior to comparing the recidivism rates of the experimental and control groups, specific data were available to indicate the precise differences in treatment received by the two groups.

The elements of the VDS program were described in Chapter 2. The evaluation design (Chapter 3) was based on members of the experimental group receiving all elements of the VDS program and members of the internal control group receiving elements on an "as avail-

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[28] Dr. Gary Gottfredson of Johns Hopkins University collaborated on the implementation of the VDS and measuring the extent of implementation. The efforts of Dr. Gottfredson increased confidence that the VDS would be thoroughly characterized and implemented.

able" basis. The VDS program elements and the evaluation design with respect to each of these are:

1. **Evaluation**: up to 3 weeks of aptitude and achievement testing, and characterization by ESC personnel of the labor market to which the inmate plans to return.
   a. Experimental subjects (the VDS participants) were to receive these services.
   b. Control group subjects were to receive only "interest inventories."
2. Development, monitoring and updating of a **correctional plan**, which outlines a program of academic, vocational, and other activities to be pursued by the inmate during incarceration.
   a. Procedures were implemented which made it more difficult for case managers to change the correctional plans of VDS participants. Specifically, approval from a review panel was required to change the correctional plan. These procedures were intended to help keep the VDS participants "on plan" and increase the likelihood of completing an integrated program of study.
   b. Changes to correctional plans for control group members did not have to be approved.
3. **Basic education**, as specified by individual correctional plans, to result in attainment of academic skills and/or GED certification.
   a. Experimental group members were to receive placement priority for these programs; additionally, they were not supposed to be transferred from training for such purposes as work details.
   b. Control group members were to participate in these programs on an "as-available" basis.
4. **Vocational education**, which is intended to provide marketable skills as identified in element 3.
   a. Experimental group members were to receive priority in placement in these programs; additionally, they were not supposed to be transferred from training for such purposes as work details.
   b. Control group members received training on an "as-available" basis.
5. A **Mutual Agreement Parole Plan** (MAPP) developed by probation and parole officers so that job development and placement personnel could provide potential employers with a guaranteed date that an offender would be available to start work.
   a. All eligible experimental group members were to have MAPP contracts specifying that they would participate in the vocational development program and would be guaranteed a release date.
   b. Members of the control group might have MAPP contracts.
6. **Community re-entry training**, which provides interviewing and other skills for "life on the outside."
   a. Experimental group members were to receive community re-entry training shortly before their release from SYC.
   b. Control group members were not eligible for this program.
7. **Job development counselling**, which includes instruction on workplace behavior and career counselling, as well as **job placement**, which taps the resources of all appropriate state agencies and includes work with the inmate throughout his incarceration.

a. Experimental group members were to receive these services.

b. Control group members were not to receive these services.

As can be seen, with the exception of evaluation, community re-entry training and job development/placement services, the difference in treatment of the experimental and control groups was defined by the availability of programs and services. Thus, if classroom space is available for all inmates, the training provided to the experimental and control group members should be approximately the same. Similarly, the experimental and internal control group members could be equally likely to have MAPP contracts.

The remainder of this section evaluates how well the VDS program was implemented. The analyses focus on whether the elements of the VDS were delivered to members of the study groups in a manner dictated by the experimental design. Section 6.1.1 considers the issue of evaluation (VDS element 1). Section 6.1.2 examines the correctional plans of members of the experimental and internal control group with respect to whether individuals participated in scheduled activities (VDS elements 2, 3, and 4). Section 6.1.3 discusses the experimental group and the development of MAPP contracts. Section 6.1.4 considers community re-entry training (VDS element 5). Section 6.1.5 considers job development counselling and placement (VDS elements 6 and 7). The discussion of whether experimental group members were more likely than controls to successfully complete programs is reserved for section 6.2. Similarly, section 6.3 addresses the issue of whether the evaluation subjects at CMYC and SYC received more vocational training than members of the external comparison group.

6.1.1 Evaluation

Participants in the VDS program were to receive a three-week battery of tests to measure their vocational interests and aptitudes. These tests were administered by two evaluators at CMYC shortly after the individuals were enrolled as experimentals in the evaluation.[27] Additionally,

[27] The tests were administered according to guidelines specified in "Evaluation and Development Implementation Standards: A Manual for Evaluatores, Intake Dorm Managers, and Development Specialists" prepared by Dr. Gary Gottfredson, The Johns Hopkins University, September 1984.

the evaluators were to work with case managers on the development of correctional plans which would lead to the VDS participant acquiring skills needed to pursue his vocational interest once he was released. A third responsibility of the evaluators was to work with the job development specialists (at SYC) and ESC personnel to determine whether job opportunities in the vocational area of choice existed in the county to which the individual would return upon release.

Although we have no "hard data" (that is, numbers) with which to analyze whether participants received this part of the VDS program, numerous conversations with CMYC personnel involved in the VDS program suggest:

1. Most experimentals did receive the battery of evaluative tests, while the controls did not.
2. Cooperation between evaluators and case managers on the development of correctional plans was sporadic, being dependent to some extent on the identity of the case manager.
3. Some efforts were made to discuss vocational plans with job development specialists and ESC personnel, although it is unlikely that even a majority of the experimentals received this service.

Thus, the VDS participants received the evaluation but they were less likely to to receive the "integrated services."

6.1.2 Correctional Plans and the Delivery of Programs

The correctional plan is a tool that has been used at CMYC and SYC for many years to outline program participation by inmates. Thus, all inmates have correctional plans. The VDS was intended to make the correctional plan more relevant to the offender by encouraging his participation in the development of the plan and by assuring that the plan--if followed--would lead to marketable job skills. Additionally, the VDS was intended to assure that the correctional plan remained current. Thus, if an offender decided to study auto mechanics rather than welding, the correctional plan should be updated to reflect this change. Finally, the VDS was intended to assure that the offender was on schedule with respect to his plan. Thus, for example, if a VDS participant was scheduled to begin auto mechanics on July 3, 1985, it was the case manager's responsibility to know whether the individual had begun the program and to investigate why if he had not.

The activity data from the Sandhills management information system provide the following information that is pertinent to this aspect of the VDS. The activity data identify all programs (vocational, academic, and personal enrichment) scheduled for all members of the experimental and control groups. For each program, the following information was available: the name of the activity, the recommended start date, the date the activity began, the date the activity ended, why the activity ended, and the grade at the completion of the activity. The data we have are current through July 6, 1986. (See the discussion of this data set in section 4.1.3.) For the analyses, we identified all activities scheduled to begin on or before July 6, 1986. All but two of our 591 enrolled control and experimental group members had one or more activities scheduled to begin on or before July 6, 1986. We will consider the following categories of activities: (1) vocational activities, defined as the vocational programs offered by the two facilities, (2) academic activities, defined as all educational (non-vocational) programs, and (3) total programs, defined as all vocational, academic, and enrichment programs. Using these data, we consider the following questions with respect to correctional plan development and implementation:

1. Were scheduled activities begun? If resources were constrained, the VDS participants' should have begun more scheduled activities than the controls.
2. How were activities terminated? If the VDS program was being followed, the VDS participants should have **completed** more activities (as opposed to being transferred or reassigned from activities) than the control group members. Additionally, the VDS participants should have been less likely to quit or never attend an activity than the controls.

6.1.2.1 Compliance as measured by beginning scheduled programs

In this section, we will consider compliance with the VDS (and the correctional plan), as measured by whether offenders began scheduled activities. We will compare (1) the number of programs scheduled for members of the experimental and internal control groups; (2) the number of programs actually begun; and, as a measure of compliance with individual correctional plans, (3) the difference between programs scheduled and programs begun.

The basis of the VDS program is, of course, the delivery of vocational programs. Therefore, we will consider this measure first. We do not necessarily expect to find a difference between

the experimentals and controls with respect to the number of planned vocational programs since vocational programs are potentially available to all inmates at CMYC and SYC. If the VDS was properly implemented **and** there was a constraint on the number of individuals who could participate in programs, the VDS participants should have begun more planned activities than the controls. The final measure to be considered is the difference between programs scheduled and programs begun. If case managers were equally diligent in monitoring the progress of all of their caseload, we would expect to see no difference in this measure. On the other hand, if they were more attentive to the experimental subjects on their caseloads, we would expect to see a difference in this measure.

The results of these analyses are given in Tables 6.1 and 6.2. Entries in the tables are the number of subjects. A significance level of $\alpha = 0.05$ was used for these analyses. As can be seen, there was no difference in the number of vocational programs planned for the members of the two groups. (The χ^2 test statistic was 6.894; the critical value for rejection of the null hypothesis of no difference in the number of activities planned for the two groups, $\chi^2_{5,0.05}$, is 11.070).[28] There is a significant difference in the number of programs started by the two groups. (The χ^2 test statistic is 12.495, larger than the critical value of 11.070.) Specifically, members of the experimental group appear more likely to have started more programs than members of the control group.

Table 6.2 reports the results of comparing for each individual the discrepancy between number of programs scheduled and number of programs begun on or before July 6, 1986. A value of "0" indicates that the individual had begun as many programs as he had scheduled, while a value of "1" or more indicates the number of scheduled programs the he had not begun. As can be seen, about 80 percent of both groups were on schedule with respect to their vocational training. Not surprisingly, we found no difference in this measure. (The χ^2 test statistic of 1.963 is smaller than 5.991, the critical value of a $\chi^2_{2,0.05}$ test.) Thus, we find the first

[28] The large number of subjects for whom no vocational programs were scheduled to begin is partially attributable to the timing of the data collection. Approximately half of the subjects were still incarcerated at CMYC or SYC when these data were collected and some had been only recently enrolled (enrollment ceased about 1 month prior to collection of these data).

Table 6.1. Vocational Programs Scheduled and Begun by Group

	Programs Planned		Programs Began	
Programs	Controls	Experimentals	Controls	Experimentals
0	120	106	145	120
1	57	44	62	46
2	55	63	44	69
3	32	49	26	36
4	23	22	13	17
>=5	8	10	5	6
Total	295	294	295	294
χ^2	6.894		12.495	

Table 6.2. Difference between Vocational Programs Scheduled and Begun

Difference	Controls	Experimentals
0	231	242
1	43	38
2	21	14
Total	295	294
χ^2	1.963	

indication that the VDS participants (the experimental group members) may have received more vocational training than members of the internal control group.

A similar analysis was conducted on academic programs scheduled and begun by the VDS participants and the internal control group members. These results are reported in Tables 6.3 and 6.4. As can be seen in Table 6.3, there is no significant difference between the two groups with respect to either the number of academic programs scheduled or the number of academic programs started. (The critical value for a $\chi^2_{3,0.05}$ test is 7.815.) A similar result (that is, no significant difference) is found with respect to compliance with the scheduled academic

programs.[29] Eighty-two percent of the experimentals and 75 percent of the controls were "in compliance" with their correctional plan for academic programs.

Our final comparison looks at total program participation by group. By "total program participation," we mean participation in vocational, academic, and personal enrichment programs. These results are reported in Tables 6.5 and 6.6. The χ^2 statistic for both the number of programs scheduled and the number of programs begun is significant at the $\alpha = 0.05$ level. (The critical value for a $\chi^2_{4,0.05}$ test is 9.488.) The VDS participants appear to be more likely to have had eleven or more programs scheduled than the internal control group members. The VDS participants also appear to have been more likely to have started 11 or more programs. With respect to compliance with the correctional plan, however, there appears to be no difference in the two groups. (The χ^2 statistic of 1.273 is smaller than the critical value of $\chi^2_{6,0.05} = 15.507$.)

The results presented in this section suggest:

1. There was no difference in the number of vocational and academic programs scheduled for the two groups of study subjects at CMYC and SYC.
2. There was a significant difference in the number of total programs scheduled for the two groups, suggesting that the experimental group members were scheduled for a significantly larger number of enrichment programs than the control group members. An examination of scheduled enrichment programs confirmed that the experimental subjects were more likely to have had more enrichment programs scheduled than the control group members (χ^2 statistic is 31.300; the critical value for $\chi^2_{4,0.05} = 9.448$.)
3. Members of the experimental group were more likely to have begun vocational and enrichment programs than members of the internal control groups. (Again, a test of the number of enrichment programs begun by the two groups yielded a χ^2 statistic of 24.924. The critical value of this test, with four degrees of freedom and $\alpha = 0.05$ is 9.448.)
4. Compliance with the correctional plan as measured by the difference between programs of each type scheduled and begun appeared to be equally good for members of both groups (see Tables 6.2, 6.4, and 6.6).

We have repeatedly noted in this chapter that we would expect to see no difference between the two groups' participation in programs if sufficient space in offered programs was available so that all could participate. One indicator of the availability of program space is the amount of time individuals had to wait to get into programs, in other words the difference between the date the program was actually begun and the recommended program start date. We calcu-

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[29] The χ^2 statistic 3.563 is significant at the $\alpha = 0.10$ level.

Table 6.3. Academic Programs Scheduled and Begun by Group

	Programs Planned		Programs Began	
Programs	Controls	Experimentals	Controls	Experimentals
0	101	100	127	120
1	98	97	113	102
2	82	79	52	64
>=3	14	18	3	8
Total	295	294	295	294
χ^2	0.564		4.274	

Table 6.4. Difference between Academic Programs Scheduled and Begun

Difference	Controls	Experimentals
0	222	241
>=1	73	53
Total	295	294
χ^2	3.563	

lated the mean wait times for each individual for each type of activity (vocational, academic, and enrichment) and then compared the means using a one-tailed t-test. The null hypothesis was that there was no difference in the mean wait times for the two groups and the alternative hypothesis was that the mean wait time for the experimental group was less than the mean wait time for the control group. The level of significance was set at $\alpha = 0.05$, which yields a critical value of the test statistic of -1.645. The results are as follows:

1. There was not a significant difference in the mean wait times for entry to vocational programs. The mean wait time for the experimental group was 8.5 days, while the mean wait time for the control group was 9.4 days. The t-statistic = -0.5233.
2. The mean wait time for entry into academic programs was **longer** for the experimental group than the control group, 3.2 days versus 2.4 days. The t-statistic = 1.6477.
3. The mean wait time for entry into enrichment programs was significantly smaller for the experimental group than the control group (18 days versus 23.6 days). The t-statistic = -3.1482.

Table 6.5. Total Programs Scheduled and Begun by Group

	Programs Planned		Programs Began	
Programs	Controls	Experimentals	Controls	Experimentals
0	69	61	84	70
1-5	41	43	90	57
6-10	92	54	81	93
11-15	78	87	35	67
> =16	15	49	5	7
Total	295	294	295	294
χ^2	28.982		19.879	

Table 6.6. Difference between Total Programs Scheduled and Begun

Difference	Controls	Experimentals
0	100	99
1	43	42
2	45	40
3	31	38
4	26	26
5	20	18
6	9	10
7	9	10
> =8	12	11
Total	295	294
χ^2	1.273	

These results suggest that academic and vocational programs were not a "constrained resource" at these two facilities. Those scheduled for these programs were able to begin the programs.

The next section will examine how members of each group terminated activities they had begun.

6.1.2.2 *Compliance as measured by program termination*

In this section, we will consider the reason offenders terminated participation in programs. We will look at terminations of vocational and academic programs. The reasons for termination are as follows: completed (the individual completed the program), reassigned (the individual was reassigned from the activity prior to completion; the reassignment to another activity was within the facility), and transferred (the individual transferred to another prison or was released prior to completing the program).[30] We will test the null hypotheses that the mean of the percent of programs completed in each manner is the same for the experimental and control groups.

A priori, we would expect the following with respect to the VDS program and our two evaluation groups:

1. The mean of the ratio "programs completed/programs attempted" should be **larger** for the experimental group than the control group, implying, of course, that, on average, the VDS participants completed more attempted programs than the control group.
2. The mean of the ratio "programs ended because of reassignment/programs attempted" should be **less** for the experimental group than the control group.
3. The mean of the ratio "programs ended because of transfer/programs attempted" should be **less** for the experimental group than the control group.

Each of these *a priori* expectations suggest that, on average, the VDS participants were in greater compliance with their correctional plans than members of the internal control group. For each case, we will use a one-tail t-test and $\alpha = 0.05$. Thus, the appropriate critical value for the first test is 1.645 and for the second and third tests is -1.645.

Our results, for the most part, confirm these expectations. Specifically, the VDS participants had completed, on average, 50.5 percent of the vocational programs attempted whereas the control group had completed, on average, only 40.9 percent. This difference is statistically significant (t statistic = 1.9227). Secondly, the mean percent of vocational programs terminated for reason of transfer was significantly less for the VDS participants than for the controls

[30] Individuals can also terminate programs by quitting or never attending. No members of either group had terminated any vocational or academic programs by quitting.

(31.8 percent versus 40.6 percent, respectively; t-statistic = -1.8660). The comparison of percent programs completed by reason of reassignment yielded an insignificant t-statistic (-0.2014); on average, 17.7 percent of programs attempted by the VDS participants and 18.5 percent of the programs attempted by the internal control group were terminated by reason of reassignment.

The results for academic program termination were somewhat similar, although the comparison of percent academic programs completed of those attempted did not yield a significant test statistic. Twenty-eight (28.1) percent of the academic programs attempted by VDS participants and 26.2 percent of the academic programs attempted by the internal control group were completed (t-statistic = 0.4523). Thirty (29.6) percent of the academic programs attempted by the VDS participants and 26.5 percent of the academic programs attempted by the internal control group were terminated because of reassignment (t-statistic = 0.6967). Thirty-two (31.8) percent of the academic programs attempted by the VDS participants and 40.6 percent of the academic programs attempted by the internal control group were terminated by transfer (t-statistic = -1,8606).

These analyses have considered program completion as a measure of compliance with the VDS program and the evaluation design. The question of whether the VDS participants were more successful in their vocational training will be addressed in section 6.2. Prior to addressing this issue, however, we will continue with our analysis of how well the program was implemented.

6.1.3 Mutual Agreement Parole Program Contracts

Mutual Agreement Parole Program contracts (MAPPs) were to be negotiated for all eligible VDS participants, whereas MAPPs **may** have been negotiated for members of the internal control group. The rationale behind integrating MAPPs into the VDS was that the MAPP would reinforce the correctional plan by making parole conditional on completion of the vocational training defined by the correctional plan. Additionally, the MAPP specifies a date of release which could improve the likelihood of finding employment prior to release.

The DOC Inmate files (section 4.1.4) contain a variable which indicates the status of an inmate's MAPP contract. Twenty-seven percent of the released VDS participants and 21 percent of the released internal control group completed a MAPP contract (63 of 232 and 46 of 218, respectively). Twenty-one percent of the released VDS participants and 26 percent of the released internal control group had a MAPP contract but did not complete it. The remainder of both groups did not have MAPP contracts. A χ^2 test revealed no significant difference between the two groups ($\chi^2 = 3.143$, 2 degrees of freedom). Members of each group were equally likely to have had MAPP contracts, not completed the contracts, or not had MAPP contracts.

6.1.4 Community Re-entry Training

The community re-entry training program is provided to inmates shortly before release from SYC. The intent is to provide skills that will help the offender "get along" in the free world. This program, which can only be provided to a limited number of students, was designated as part of the VDS program. Compliance with the VDS program would suggest that all VDS participants (experimentals) should have received the training. Compliance with the experimental design would suggest that no control group members received the training. As the Community Re-entry Training is an activity of SYC, it is included in the activity data base. As of July 1, 1986, when this data base was established, 151 experimental group members and 128 internal control group members had been released from the North Carolina prison system.[31] Of these released subjects, 63 VDS participants and 4 control group members had participated in the CRT program. This finding suggests compliance with the evaluation design ("no" control group members participated in the CRT program), but suggests a lack of compliance with the VDS program plan (less than 41 percent of the released VDS participants received the community re-entry training). At least part of this discrepancy is due to individuals being transferred to a facility other than SYC (where the program was offered) or released from CMYC.

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[31] This is the date of release from the prison system, not the date of, for example, transfer from CMYC or SYC to another prison. Thus, this figure underestimates the number of evaluation subjects still incarcerated at CMYC and SYC.

6.1.5 Job Development and Placement

The final element of the VDS program involves assisting VDS participants in finding a job. Job development specialists at SYC begin this task with the VDS participants prior to release; assistance prior to and after release is provided by ESC offender specialists. Ideal employment would use skills developed as a result of vocational training. This assistance was provided to most experimental group members who were transferred to SYC from CMYC. Additionally, it is believed that offender specialists made an effort to locate and help those transferred to facilities other than SYC. The following problems were reported during the course of the evaluation with respect to this part of the VDS program. First, offender specialists reported that training-related employment was often difficult to find and that many of their clients simply took the first job that was available. (This action was particularly true of paroled offenders for whom employment was a condition of their parole.) Secondly, the amount of training provided was often judged insufficient for placement in related employment. Thirdly, although the offender specialists were supposed to meet with their clients prior to their release, this was often not possible for the offender specialists from the western part of the state (about 250 miles from SYC). Measures of the effectiveness of this part of the VDS program include (1) whether those receiving these services were more likely to be employed and (2) whether the quality of the employment was "better." As will be seen in Chapter 7, we could find no significant differences in the characteristics of post-release employment for the study groups.

6.2 Treatment Effectiveness: VDS and Program Success

The integrated approach to correctional plan development, in concert with monitoring of progress on the plan, is hypothesized to increase the vocational skills of VDS participants. One measure of increased skills available from our activity data base is the grade received at the completion (termination) of a program. In this section, we consider the "success" of the two study groups with respect to vocational, academic, and enrichment programs. Specifically, we compare the experimental and internal control groups on the following measures:

1. Number of vocational programs successfully completed.
2. Vocational programs successfully completed as a percent of programs attempted and as a percent of programs completed.
3. Total time spent in vocational programs.
4. Number of academic programs successfully completed.
5. Academic programs successfully completed as a percent of programs attempted and as a percent of programs completed.
6. Total time spent in academic programs.

We also briefly compare participation in enrichment programs and all programs. **All results pertain to completed programs.** Some of the individuals were still incarcerated at CMYC or SYC when these data were collected in July 1986 and, thus, their program participation could be expected to continue. All results, therefore, understate program participation for the two study groups. As control and experimental group members were randomly enrolled throughout the enrollment period, were likely to remain in prison for the same length of time (on average), and were equally likely to have been transferred to other facilities (see section 6.1.2.2), the results should not reflect any bias with respect to group.

A large number of activities are available at CMYC and SYC. The activities were categorized for the analyses as either (1) vocational, (2) academic, (3) enrichment, or (4) work. Sixteen vocational programs were offered at one or both facilities during some or all of the period under consideration; these programs included those in construction t ades, auto mechanics, metal working, graphic arts, food services, upholstery, and office management. Ten academic programs were offered, including pre-GED classes, GED classes, post-GED classes, and study release at Sandhills Community College. Thirty-five personal enrichment activities were offered including drug and alcohol counselling, Jaycees, and Explorers. Twenty activities were classified as "work," including assignment as library, academic, and vocational program aides, to the kitchen, laundry, or maintenance details, and assignment to Department of Transportation road crews. Neither facility has a "prison industry." Analyses revealed that individuals never "completed" work activities, rather their termination in these activities were due almost exclusively to leaving the prison, therefore, we will not consider this measure further.

An individual's participation in an activity terminated primarily as a result of completion, transfer to another institution, or reassignment within the two institutions; other reasons for termination were "never attended," escaped (no subjects), and quit. These six categories were reduced to four for the analyses: completion ("C"), reassignment ("R," which refers to reassignment within the two facilities), transfer ("T," which refers to transfer to a facility other than CMYC or SYC), and quit ("Q," which includes both never attended and quit).

A variety of grading schemes are used for the activities, including numeric grades and letter grades. Scores out (i.e., grade at termination) were coded as either satisfactory ("S") or unsatisfactory ("U"). The following scores were categorized as satisfactory:

1. Achievement equal to or greater than the 7th grade level (some academic work);
2. Scores of equal to or greater than 70% (some academic work; vocational training); and
3. Letter grades of A, B, C, E (excellent), S (satisfactory), or P (pass).

The following scores were categorized as unsatisfactory:

1. Achievement of less than 7th grade level;
2. Scores of less than 70 percent; and
3. Letter grades of D, F, I (incomplete), or U (unsatisfactory).

Using these three categories (activity type = vocational, academic, enrichment); why activity ended = C, R,T or Q), and score out = S or U), variables were created to measure activity participation and success for each of the participants. These variables are number of activities attempted of each type, number of activities completed of each type, number of activities successfully completed of each type, and total number of activities attempted, completed, and successfully completed. Additionally, the percentage of programs of each type that was completed successfully (of programs completed and of programs attempted) was calculated as a proxy for the stability of program participation and as an indicator of VDS implementation (as the VDS program is supposed to "keep an offender on a predetermined course").

The results presented in this report will focus on vocational program participation, as this area is the primary focus of the VDS. As implementation of the VDS program applied "rules and

regulations" to the movement of experimental group members for all activities, the VDS program may had had a "carry over" effect to activities other than vocational activities. Thus, for example, not only may members of the experimental group have successfully completed more vocational programs but also may have successfully completed more academic and enrichment programs.

The results presented below indicate that the VDS had these desired effects--members of the experimental group were more likely to successfully complete activities than were members of the internal control group. These results are particularly encouraging since the number of activities attempted are not different for the two groups--indicating that denial of activities to controls (as a result of limited space in various programs) is not the reason for the higher success rate. In addition to examining results for the entire 3-year period (June 1983 through July 1986), separate analyses were conducted to examine the effect of enrollment date on the success of VDS participants in vocational programs. Members of the internal control and experimental groups were assigned to "6-month enrollment cohorts" based on the date that they were enrolled in the evaluation. These analyses were directed at establishing whether the VDS improved over the course of the evaluation period under consideration here.

6.2.1 Successful Vocational Program Completion

The VDS is intended to improve vocational activity participation and as such should result in greater success in vocational training for program participants. We consider the following measures of successful vocational program participation: (1) number of vocational programs attempted, completed, and successfully completed by each of the two study groups; (2) vocational programs successfully completed as a percent of vocational programs completed by the study groups; (3) vocational programs successfully completed as a percent of vocational programs attempted by the two study groups; and (4) the average number of days spent in vocational training by the two study groups. This section concludes with the results of vocational program participation and success by 6-month enrollment cohort.

6.2.1.1 *Vocational program participation for the study period*

Table 6.7 shows the number of vocational programs attempted (VPA) completed (VPC), and successfully completed (VPCS) by members of the two study groups (controls, C, and experimentals, E). The proportion of each group attempting none, one, two, or three or more vocational programs is not significantly different. (The χ^2 test statistic was 4.884; the $\chi^2_{3,0.05}$ critical value is 7.815.) In other words, there is no difference in the number of programs attempted by members of the two groups; 55 percent of the experimental group and 51 percent of the control group had attempted one or more programs. The proportion of each group completing none, one, two, or three vocational programs is also not significantly different, although this measure is significant at the $\alpha = 0.10$ level. Thirty-four percent of the experimentals and 27 percent of the controls completed one or more programs. The χ^2 statistic for the comparison of the proportion of each group who **successfully completed** none, one, two, or three or more programs is 10.267, which is significant at the $\alpha = 0.05$ level. Thirty percent of the experimental group and 20 percent of the control group successfully completed one or more vocational programs. Thus, the VDS program appears to have been effective in increasing the number of subjects successfully completing programs. This result is particularly encouraging since the numbers of activities attempted are not different for the two groups--indicating that denial of programs to control group members (as a result of limited space) is not the reason for the higher success rate.

In addition to the number of programs successfully completed, the percentage of programs completed successfully (of programs completed and attempted) was calculated for each group. These measures serve as a proxy for program stability. The *a priori* expectation is that the percentage of programs successfully completed will be higher for the experimentals. On average, members of the control group successfully completed 68.7 percent of the vocational programs they attempted compared with 79.7 percent of the experimental group. This difference is significant at the $\alpha = 0.05$ level, using a one-tailed test. (The t-statistic = 1.8291; the critical value is 1.645.) For the comparison of the percentage of programs successfully completed of programs attempted, we find that, on average, the control group successfully completed 29.5 percent of attempted programs while the experimental group successfully

Table 6.7. Vocational Program Participation by Group

	VPA		VPC		VPCS	
Number	C	E	C	E	C	E
0	144	134	216	194	238	207
1	53	39	35	31	24	29
2	49	60	33	51	26	50
>=3	50	62	12	19	8	9
Total	296	295	296	295	296	295
χ^2	4.884		6.859		10.267	

completed 41 percent. The t-statistic for this comparison is 2.4635, which is significant at the $\alpha = 0.05$ level. Thus, the experimentals were successful at a higher percentage of programs attempted and completed.

Another measure of attainment in vocational programs is the total time spent in vocational programs. (This measure was calculated as the sum of "date ended minus date begun" for all vocational programs in which the subject participated; therefore, it is actually the number of days enrolled in vocational programs.) The control group spent an average of 129.4 days in vocational programs, while the experimental group spent an average of 149.7 days in vocational programs. The t-statistic for this comparison is 1.4589. This statistic is not significant at the $\alpha = 0.05$ level, but is significant at the $\alpha = 0.10$ level, for a one-tail test.

Results presented in this section show that the VDS has been effective in increasing the successful completion of vocational programs by participants. An important finding is that the program participants (experimentals) did not receive training in lieu of the controls; control group members were as likely as the experimental group members to attempt vocational programs and spent about the same amount of time in vocational classes.

6.2.1.2 *Vocational program participation by enrollment cohort*

The previous section showed that there was a significant difference in successful program completion between the experimental and control groups. In this section, we address whether there was an improvement with respect to time. In other words, we are interested in determining whether the VDS program became more effective as prison staff experience with the program grew. For these analyses, the experimental and internal control group members were assigned to one of six cohorts based on the date of enrollment into the study. The enrollment periods were defined as six-month intervals beginning June 1, 1983. We examine this issue by looking at the percentage of each cohort who (1) attempted one or more vocational programs ($VPA \geq 1$), (2) completed one or more vocational programs ($VPC \geq 1$), and (3) successfully completed one or more vocational programs ($VPCS \geq 1$). If the VDS became more effective over time, we would expect to see an increase in the percentage of VDS participants successfully completing programs.

Results, by evaluation group, are given in Table 6.8. The percentage of subjects in each group attempting vocational programs remained relatively constant over the six enrollment periods, although a slight upward trend is apparent for both groups.[32] The largest differences between the two groups occurred during the first year of enrollment (Periods 1 and 2), when about 45 percent of the control group and 54 percent of the experimental group attempted vocational programs. Figure 3 displays the data on vocational programs attempted that is given in Table 6.8.

Table 6.8 also shows the number of individuals in each group cohort who completed one or more programs. This percentage increased for both groups over the evaluation period. Only 26 percent of the experimental group enrolled in Period 1 completed one or more programs compared with 46 percent in Period 5. More dramatically, only 11 percent of the control group enrolled in Period 1 completed one or more programs compared with 41 percent in Period 5. This trend for both groups suggests that, perhaps, a "spillover" effect occurred with respect

[32] The figures for Period 6 are misleading, as many of these individuals were enrolled shortly before the data were collected and, thus, would not yet have been scheduled for or begun programs.

Table 6.8. Vocational Program Participation By Enrollment Cohort

Experimentals				
Period	No.	*VPA* ≥ 1	*VPC* ≥ 1	*VPCS* ≥ 1
1	34	18	9	6
2	30	17	8	6
3	44	25	13	13
4	48	33	23	21
5	58	39	27	27
6	81	29	21	15
Total	295	161	101	88
Controls				
Period	No.	*VPA* ≥ 1	*VPC* ≥ 1	*VPCS* ≥ 1
1	36	17	4	3
2	34	15	9	7
3	46	32	12	9
4	48	24	12	10
5	58	37	24	18
6	74	27	19	11
Total	296	152	80	58

to the controls. In other words, program aspects applied to the experimentals may have been applied to the controls as case managers integrated these techniques into their duties.

This trend is more apparent when we consider the percentage of each group cohort who **successfully completed** one or more vocational programs. As shown in Figure 4, only 17 percent (9 of 34) of the experimentals enrolled in Period 1 successfully completed one or more vocational programs while 46 percent of those enrolled in Period 4 successfully completed one or more programs. A similar result obtains for the control group cohorts: 8 percent of the control group enrolled in Period 1 successfully completed one or more vocational programs, while 31 percent of those enrolled in Period 4 successfully completed one or more.

Table 6.8 and Figure 4 suggest that Periods 1 through 3 appear to constitute a "start-up state" which is followed by the "steady state" equilibrium of Periods 4 and 5. The "decline" in percentage successfully completing programs between Periods 4 and 5 may be due to subjects

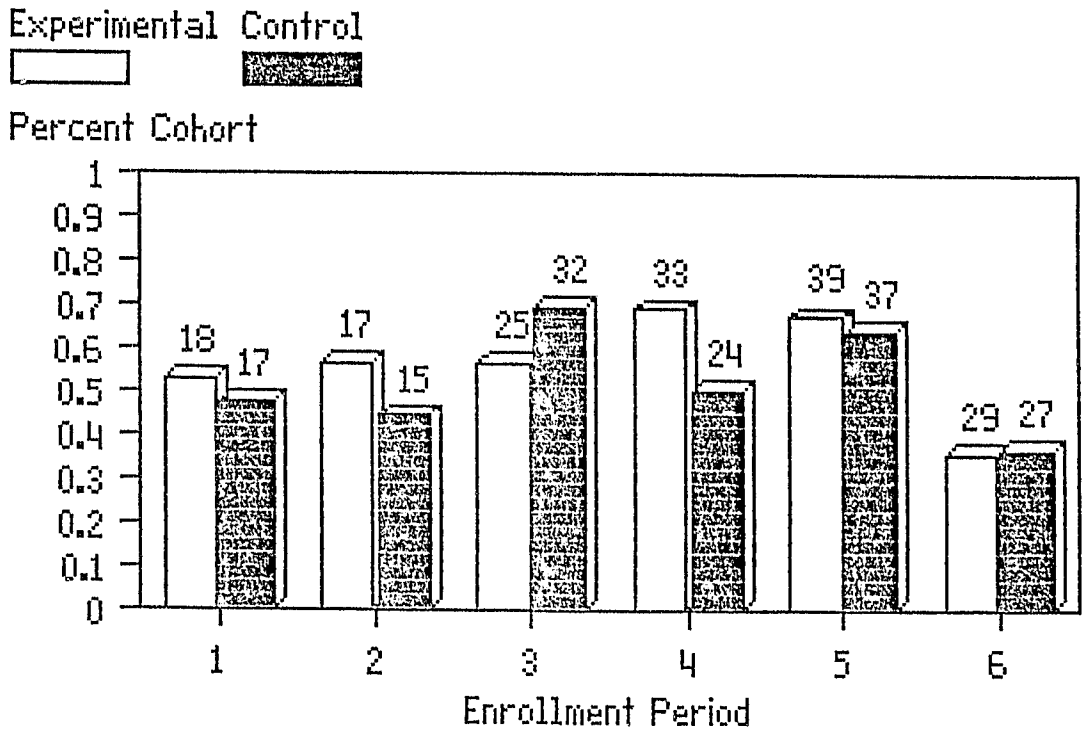

Figure 3. Percentage of cohorts attempting one or more vocational programs: The figure shows, by evaluation group and enrollment cohort, the percentage of each cohort attempting one or more vocational programs.

who were still completing vocational programs when the data were acquired in July 1986. As was discussed in Chapter 4, we are continuing our attempts to acquire the data for the period between July 1986 and February 1987 (when the management information system "crashed"). These eight months of data would provide insight into whether the VDS program "peaked" two years into the evaluation and has since declined, reached an equilibrium two years into the evaluation, or is continuing to show signs of strengthening.

The next section compares the experimental and internal control group in terms of successful completion of academic programs.

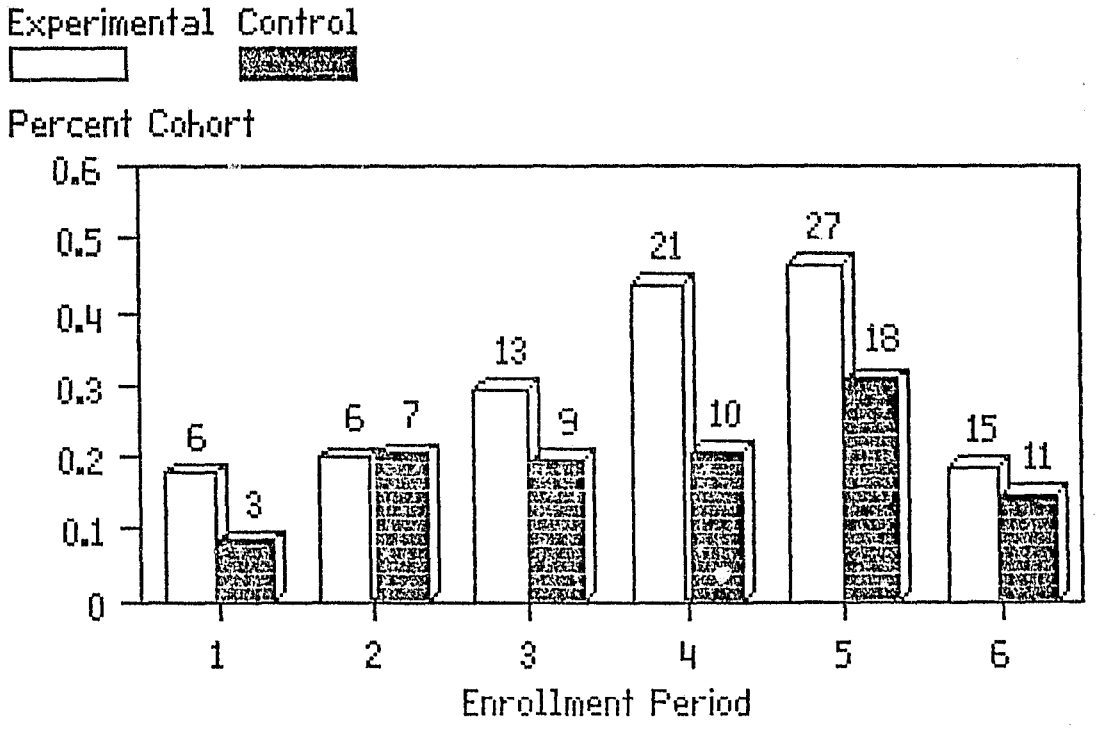

Figure 4. Percentage of cohorts successfully completing vocational programs: The figure shows, by evaluation group and enrollment cohort, the percentage of each cohort successfully completing one or more vocational programs.

6.2.2 Successful Academic Program Completion

This section presents an analysis of academic program completion similar to that presented in the previous section for vocational program compietion. The measures of interest are the number of academic programs attempted, completed, and successfully completed; the percentage of completed and attempted academic programs completed successfully; and the total time spent in academic programs. The results of analyses on these measures are similar to those found for vocational programs--members of both groups were equally likely to

attempt programs, but members of the experimental group successfully completed more academic programs. The number of academic programs attempted (APA), completed (APC), and successfully completed (APCS) are shown by group (C, control; E, experimental) in Table 6.9.

As can be seen from Table 6.9, very few members of each group were successful in completing academic programs. Only 4 members of the control group (1.35 percent) and 14 members of the experimental group (1.36 percent) successfully completed one academic program. On average, members of the control group successfully completed 6.6 percent of academic programs completed and only 1.2 percent of academic programs attempted. Members of the experimental group did significantly better, successfully completing 20.8 percent of programs completed and 5.1 percent of academic programs attempted. (These two comparisons between the experimental and control groups are significant at the $\alpha = 0.05$ level. The t-statistics are 2.3912 for the comparison of successful completions as a percent of completions and 2.5008 for the comparison of successful completions as a percent of programs attempted.)

The amount of time spent in academic programs was not different for the two groups. Members of the control group spent, on average, 98.8 days in academic programs, while members of the experimental group spent 106.2 days. (The t-statistic for the difference of these two means was 0.5907.)

6.2.3 Successful Enrichment Program Completion

The VDS was not designed to affect assignment of individuals to enrichment programs. For the purpose of these analyses, an enrichment program was defined as any activity which was not vocational, academic, or work. Thus, enrichment programs include lifeskills training, community re-entry training, AA, drug counselling, Jaycees, Explorers, and a variety of other activities.[33] In this section, we compare whether experimental group members attempted,

[33] The activity data also included indicators of psychological counselling. These activities were not included as enrichment programs.

Table 6.9. Academic Program Participation by Group

	APA		APC		APCS	
Number	C	E	C	E	C	E
0	134	136	235	230	292	281
>=1	162	159	61	65	4	14
Total	296	295	296	295	296	295
χ^2	0.014		0.861		5.765	

completed, and successfully completed more enrichment programs. The number of each group who attempted, completed, and successfully completed enrichment program(s) is shown in Table 6.10. (EPA is enrichment programs attempted, EPC is enrichment programs completed, and EPCS is enrichment programs completed successfully.)

As can be seen, members of the experimental group and control groups attempted the same numbers of enrichment programs. The experimental group members, however, completed and successfully completed more enrichment programs than did members of the control group.

Members of the control group successfully completed 44.7 percent of enrichment programs completed compared with 29.8 percent for members of the experimental group. This difference is significant (t-statistic = 4.2891). There was no difference between the two groups in the percentage of programs successfully completed of programs attempted. Control group members, on average, successfully completed 14 percent of enrichment programs attempted compared to 12.6 percent for members of the experimental group (t-statistic = 0.8371).

6.2.4 Summary

This section has looked at the effectiveness of the VDS program as measured by successful completion of programs at CMYC and SYC by the experimental and internal control groups. The results can be summarized as follows:

Table 6.10. Enrichment Program Participation by Group

	EPA		EPC		EPCS	
Number	C	E	C	E	C	E
0	86	78	113	102	170	155
1	24	15	86	27	124	120
2	13	21	53	55	2	20
3	21	21	28	41		
4	24	14	10	38		
> =5	128	146	6	32		
Total	296	295	296	295	296	295
χ^2	8.162		67.976		15.484	

1. Members of both groups attempted equal numbers of vocational, academic, and enrichment programs.
2. Experimental group members completed more vocational and enrichment programs, but about the same number of academic programs.
3. Experimental group members successfully completed more programs of all types than did members of the internal control group.

6.3 *Inter-facility Comparison of Vocational Program Participation*

The previous two sections considered the difference in program exposure of the two groups at CMYC and SYC (the experimental and internal control group). In this section, we compare the vocational program participation of members of the external comparison group with the vocational programs participation of the experimental/internal control group members who were enrolled prior to November 4, 1984 (Phase I of the evaluation). Additionally, we consider only those subjects who were released when these data were acquired in May 1987 (196 experimental/internal control group members and 222 external comparison group members). The data for these analyses were extracted from the DOC Inmate Files, which include entries for educational program participation.[34]

[34] We have no information on how the program was completed, that is whether the inmate passed the

An initial examination of number of vocational programs completed by these groups revealed that the two groups at CMYC/SYC were much more likely to have participated in a vocational program than members of the external comparison group. Specifically, 62 percent of the CMYC/SYC group (122 of 196) participated in one or more vocational programs, while only 12 percent (27 of 222) of the external comparison group patrticipated in one or more vocational programs. As members of the CMYC/SYC group had served longer sentences, on average, than members of the external comparison group (see Chapter 5), the analyses were re-run controlling for the length of time served. The following time periods were identified: less than one year (1 Year), one to two years (2 Years), and more than three years (3 Years). Results of these analyses are presented in Table 6.11. "CE" refers to the experimental/internal control groups and "PH" refers to the external comparison group. As can be seen, even controlling for time served, the offenders who were assigned to CMYC/SYC were much more likely to have attempted vocational programs.

6.4 Summary and Conclusions

The evaluation of the VDS program was based on the implementation of a true experimental design which required that a group of randomly selected inmates (the experimentals) received all of the VDS services, while a second group of randomly selected inmates (the internal controls) received only some of the VDS services on an "as available" basis. A third group, the external control group, was confined outside of CMYC/SYC and therefore received no VDS services. This chapter focused on issues pertaining to program delivery, examining evidence related to the implementation of the VDS program, the provision of services to the experimental and internal control groups, and the completion of vocational programs by members of the experimental, internal control, and external comparison groups. Secondly, we considered whether the VDS program was effective in increasing participants' vocational skills. We

course, nor any information on the length of time spent in the programs that can be used for comparisons of these groups. A comparison of the DOC files with the more descriptive (with respect to completion indicators) data for the CMYC's suggests that the variable in the DOC files indicates programs attempted rather than programs completed. Thus, it may be more accurate to interpret this information as a proxy for exposure to vocational training. This is the assumption we make in the analyses in this section.

Table 6.11 Inter-facility Comparison of Completed Vocational Programs

	1 Year		2 Years		3 Years	
Number	CE	PH	CE	PH	CE	PH
0	18	122	31	55	25	19
>=1	16	8	40	11	66	8
Total	34	130	71	66	91	27
χ^2	32.898		21.370		14.603	

addressed this question by comparing the successful program completions of the experimental and internal control group subjects.

As was described in Chapter 3, the VDS is an integrated program which consists of seven elements:

1. Evaluation of participants;
2. Development, monitoring and updating of a correctional plan;
3. Delivery of basic education;
4. Vocational education;
5. Development of a Mutual Agreement Parole Program (MAPP) contract;
6. Community re-entry training; and
7. Job development counselling and job placement services.

Each of these services was available to both experimental and control group members with the exception of elements 1 (evaluation), 6 (community re-entry training), and 7 (job development and placement). The provision of the other four services was constrained only by the availability of services (e.g., classroom space), with experimental group members receiving priority for placement in programs.

Anecdotal evidence was presented which suggested that experimental group members did receive the evaluation services, whereas the control group members did not. This evidence also suggests that efforts were made to discuss vocational plans with job placement specialists and ESC personnel, although it is unlikely that the majority of experimental group mem-

bers received these services. The final "unique" service to be provided to the VDS participants was community re-entry training. Less than 50 percent of released experimental group members participated in this program. Thus, the three elements of the VDS which were unique to experimentals were only partially implemented.

Elements 2 (correctional plan development, etc.), 3 (basic education), and 4 (vocational training) comprise the "heart" of the VDS. Determination of how well the correctional plan was implemented, updated and followed was thus of critical interest in the evaluation of the VDS implementation. A correctional plan, which outlines program participation, is developed for all inmates at CMYC and SYC. The programs or activities included in the correctional plan include vocational, academic and personal enrichment programs. Compliance with the correctional plan was measured by (1) comparing the number of programs scheduled with the number begun, and (2) comparing how programs were terminated (completion, transfer, reassignment or quit). The results from the activity data showed that there was no significant difference in the number of vocational and academic programs scheduled for the two CMYC/SYC groups. There was, however, a significant difference in the total number of programs scheduled, suggesting that the experimental group members, on average, were scheduled for a larger number of enrichment programs than were the controls. Compliance as measured by the difference between the number of programs scheduled and the number of programs begun appears to be equally good for members of both groups. A second measure of compliance with the VDS program was the reason for vocational and academic program termination. The VDS was intended to encourage an inmate to participate in and complete the activities in his correctional plan. Thus, if the VDS was properly implemented, we would expect to find members of the experimental group completing a higher percentage of programs attempted and being transferred or reassigned from a smaller percentage of programs than members of the internal control group. Our results suggest that experimentals did complete a significantly larger percentage of programs attempted and were transferred from a significantly smaller percentage of programs than the controls. Additional analyses on the waiting time to enter vocational and academic programs showed no difference in the mean waiting times for these programs of the two CMYC/SYC groups. These results suggest that the academic and vocational programs were not a constrained resource at CMYC/SYC;

those scheduled were equally likely to enter a vocational or educational program within approximately the same amount of time.

The final element of the VDS program is the development of a MAPP contract. Experimental group members were to be given special consideration in the development of MAPP contracts. Our results showed, however, that members of each group were equally likely to have a MAPP contract, to have not completed a contract, or to not have had a contract.

Thus, although some elements of the VDS were implemented (for example, correctional plans), other elements (for example, MAPPs, and community re-entry training) were not universally delivered. Other elements (the evaluation and job development/placement services) were most likely delivered only in part. In particular, services requiring coordination between individuals or agencies were less likely to be delivered. Results do show, however, that members of the experimental group received more of the VDS services (particularly with respect to training) than did members of the control group.

The integrated approach to correctional plan development was hypothesized to increase the vocational skills of VDS participants. One proxy for increased skills is the grade received at the completion of a program. The two study groups were compared with respect to their "success" in the completion of vocational, academic and enrichment programs. Results showed that the VDS had the desired effect; members of the experimental group were more likely to successfully complete activities in which they were enrolled than were members of the control group. It should be noted that only 30 percent of the experimentals successfully completed vocational programs. This significant difference is important, however, and is particularly encouraging given that the number of programs attempted by the two groups did not differ significantly, indicating that the lower success rate among controls was not due to limited access to programs.

Vocational program participation of the two groups was also examined for "enrollmemt cohorts" to determine whether the VDS program became more effective with time. Results showed that the number of individuals in each cohort who completed one or more programs

increased for both groups over time. In addition, there was an increase in the number of participants who successfully completed one or more programs. This trend suggests that a "spillover" effect may have occurred with respect to the control group. The presumption is that as case managers integrated these techniques into their duties more program elements were applied to the control group. The analyses of program delivery by time period suggests that during the first 18 months the project was in a "start up" or transition phase after which time the program reached a "steady-state."

In summary, when the effectiveness of the VDS program is measured by the successful completion of programs, the results indicate that members of both groups attempted equal numbers of all programs, experimental group members completed more vocational and enrichment programs, and experimental group members successfully completed more programs of all types than did members of the internal control group.

The final program delivery analyses examined the differences in vocational programs attempted by the external comparison group and participants enrolled at CMYC/SYC. The external comparison group did not receive any exposure to the VDS, but did receive some vocational and educational programs at the Polk/Harnett facilities. For this Phase I enrollment cohort, the results showed that 62% of the CMYC/SYC group completed one or more programs whereas only 12% of the external controls completed one or more programs. The analyses were rerun to control for the length of time served (participants at CMYC/SYC served longer sentences). Results of this analysis confirmed that the CMYC/SYC group completed more programs.

7.0 Post-Release Employment

The previous chapter presented results which showed that VDS participants (experimentals) were more likely than the internal control group to successfully complete one or more vocational programs. The variable "successful program completion" is viewed as a proxy for improved vocational skills, which is the first "link" in the "causal chain" between the VDS program and reduced recidivism. The second link in the establishment of a "causal" relationship between the Sandhills VDS and a reduction in recidivism is that these vocational skills in combination with the job development and placement components of the VDS will result in better post-release employment. The hypothesis being tested is that vocational program completion should result in a subject obtaining a better job post-release. The analyses will focus on the following:

1. Were VDS participants (the experimental group) more likely to find employment following release than members of the internal control group?
2. Were VDS participants more likely to receive higher wages than members of the internal control group?
3. Were members of the two CMYC/SYC groups (experimental and internal control) more likely to find employment following release than members of the external comparison group?
4. Were members of the two CMYC/SYC groups more likely to receive higher wages than members of the external comparison group?

Two sources of data were used for these analyses: primary follow-up data secured by parole officers or ESC offender specialists and wage data obtained from the ESC. Primary source follow-up data were collected through May 1987. ESC wage data are current through the second quarter of 1987. Each of these data sets has limitations. Specifically, primary source follow-up data were available for only 55 percent of the released subjects (63 percent of the experimentals, 46 percent of the internal controls, and 57 percent of the external compar-

isons).[35] Also, we were more likely to have follow-up data for subjects who were conditionally released (75 percent) or paroled (60 percent) than who were discharged (46 percent).[36] These differences derive, it is believed, from the manner in which these data were collected. The first source of primary source data was the participant's parole officer; if the individual was not on parole, an Employment Security Commission offender specialist attempted to collect the needed information. A parole officer was equally likely to know and report the current status of a parolee (whether an experimental or a control); the same was not true, however, for the offender specialist. The offender specialist was working with experimentals, but had to "search out" control group members. Thus, the offender specialist was more likely to know and report the current status of an experimental than a control.[37] It is also likely that the offender specialist was better able to locate the control group members who are employed. Any bias in the data collection, therefore, would work in favor of the control group, with positive information (the individual is employed) more likely to be available than negative information (the individual is unemployed) for this group. We have chosen to analyze these data in spite of these limitations because the data which are available provide a more complete picture of the post-release activities of the subjects than is available from our other source, the ESC wage data base. Specifically, the following data will be analyzed for our two comparisons, intra-facility and inter-facility:

1. Weekly wage post-release (**WKLYWAGE**);
2. Type of activity engaged in post-release (**ACTCODE**); and
3. Industry (**INDCODE**).

WKLYWAGE is the weekly wage reported on the first follow-up form, which was generally completed 30-to-45 days post-release. The **ACTCODE** is a binary indicator of whether the subject was engaged in "positive" or "negative" activity at the time the data were collected. Positive activities were employment, schooling, and participation in apprentice or training

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[35] The χ^2 statistic for this comparison was 14.119, which is significant at the $\alpha = 0.05$ level.

[36] The χ^2 statistic for this comparison was 28.702, which is significant at the $\alpha = 0.05$ level.

[37] Additionally, it is possible that requests for follow-up data were more likely for experimental group members. Requests for information on these two groups were sent by the job development specialist--again, individuals who were supposed to "work" with the experimentals and not with the controls.

programs. Negative activities were unemployment, arrest, or re-incarceration. The **INDCODE** variable was derived from Standard Industry Codes reported for employed subjects. This variable was originally defined by the ten major categories of industries listed in the SIC codebook; but, as most subjects were working in either construction, manufacturing, and retail trade, these ten categories were reduced to four: construction, manufacturing, retail trade, and "other."

The ESC wage data are not compromised by the type of bias identified in the primary source follow-up data. These data are, however, subject to two limitations. First, we were able to acquire social security numbers for only 568 of the 674 released subjects (84 percent of the experimentals, 82 percent of the internal controls, and 87 percent of the external comparisons). The second limitation is inherent to the ESC data base--it contains wage information only for jobs covered by the unemployment insurance act. Thus, these data will not reflect the wages of subjects if they were, for example, self-employed or working for a small business. Neither of these limitations is likely to be correlated with the group to which a subject was assigned for our study, thus we don't believe that these data are biased. We analyze the following data from the ESC wage files:

1. First quarter's wage following release (**QTRWAGE**), defined as the wages earned in the quarter following the quarter of release; and
2. Number of employers in the first quarter following release (**QTREMPNO**).

The variable **QTREMPNO** is a proxy for employment stability.

The remainder of this Chapter is organized as follows: Section 7.1 provides the results of the intra-facility comparisons of post-release employment. Section 7.2 provides the results of the inter-facility comparisons of post-release employment. Section 7.3 provides a discussion and summary of the chapter.

7.1 Intra-Facility Comparisons of Post-Release Employment

This section compares the post-release activities of members of the experimental and internal control groups. The first measure we consider is **ACTCODE**, the variable indicating whether the individual was engaged in a "positive" or "negative" activity at the first report post-release.[38] The results, shown in Table 7.1, reveal that there was no significant difference in the post-release activity of the experimental and internal control groups. Members of each group were equally likely to be engaged in positive and negative activities.[39]

We next examine our two wage measures (**WKLYWAGE** and **QTRWAGE**). We had weekly wage information from the primary source follow-up forms for 56 internal control group members and 77 experimental group members. The average weekly wages reported were $4.33 and $4.28 for the controls and experimentals, respectively (t-statistic = 0.2498). We had quarterly wage data for 134 members of each group. The mean quarterly wages were $1006.23 and $915.64 for the controls and experimentals, respectively (t-statistic = 0.7530). The critical value for a one-tailed test of the null hypothesis that the wages post-release of these two groups are equal is 1.645 for both of our measures. Thus, we conclude that there is no difference in the post-release wages of the experimental and internal control group members.

The fourth measure of post-release employment is the number of employers in the first (complete) quarter following release. As previously noted, we view this varible as a proxy for employment stability or, perhaps, job satisfaction. The value of this variable ranged from 0 to 4. Results of the comparison of our two study groups on this measure are shown in Table 7.2. As can be seen, again, there was not a significant difference between the two groups.

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[38] "Positive activity" was defined as any employment, schooling, or training activity. "Negative activity" was defined as unemployment, arrest, or re-incarceration.

[39] The χ^2 statistic is significant at the $\alpha = 0.10$ level, implying, at this level of significance, that the control group members were more likely to be engaged in positive activities post-release than were the experimentals. See the discussion at the beginning of this chapter on the bias in this data set for a possible explanation.

Table 7.1. Post-Release Activity by Group (Control, Experimental)

Type Activity	Controls	Experimentals
Positive	70	87
Negative	29	58
Total	99	145
χ^2	2.940	

We also found no difference between the two groups in terms of the industries in which they were working. The results for the variable **INDCODE** are given in Table 7.3. The χ^2 statistic of 2.599 is less than the critical value $\chi^2_{3,0.05} = 7.815$.

The results presented thus far in this section have compared the experimental and internal control groups over the entire study period. As the study was ongoing for more than four years, we re-examined the data after assigning subjects to (1) enrollment cohorts (that is Phase I or Phase II) and (2) release cohorts (released in 1984 or earlier, released in 1985, 1986, 1987). The cohort assignments were an effort to control for (1) program improvements and (2) economic conditions at the time of release. The results of these analyses did not differ from those reported above.

Thus, there does not appear to be any difference in the post-release employment for members of these two study groups. This finding is disappointing given that (1) members of the experimental group successfully completed more vocational programs than members of the control group, and (2) members of the experimental group received job development and placement services which were not provided to the control group. This finding should, however, be judged with respect to our findings in Chapter 6 which showed that only about 30 percent of the experimentals had successfully completed programs as compared to 20 percent of the control group.

Table 7.2. "First Quarter" Employers by Group (Control, Experimental)

Number Employers	Controls	Experimentals
0	34	39
1	68	63
2	25	25
> =3	7	7
Total	134	134
χ^2	0.533	

7.2 *Inter-Facility Comparisons of Post-Release Employment*

This section compares the post-release activities of the two groups at CMCY/SYC (CE) with those of the external comparison group (PH). For these analyses, we consider the CMYC/SYC subjects who were enrolled during Phase I of the project which ended November 11, 1984. The approach to the analyses is the same as that taken in the previous section. The results are also similar. The first measure we consider is **ACTCODE**, the variable indicating whether the individual was engaged in a "positive" or "negative" activity at the first report post-release. The results, shown in Table 7.4, reveal that there was no significant difference in the post-release activity of the experimental and internal control groups. Members of each group were equally likely to be engaged in positive and negative activities.

The results for our two wage measures (**WKLYWAGE** and **QTRWAGE**) are considered next. We had weekly wage information from the primary source follow-up forms for 53 CMYC/SYC subjects and 60 external control group members. The average weekly wages reported were $4.43 and $3.93 for the CE and PH groups, respectively. The difference in these wages is significant at the $\alpha = 0.05$ level (t-statistic = 2.2708), indicating--at least initially--that members of the CMYC/SYC groups were finding better-paying employment than members of the external control group. As all CMYC/SYC subjects received some VDS services, this result would appear to suggest that the VDS was having the desired effect. However, this result did

Table 7.3. First Employment Industry by Group (Control, Experimental)

Industry	Controls	Experimentals
Construction	18	35
Manufacturing	19	19
Retail Trade	9	13
Other Industry	12	14
Total	58	81
χ^2	2.599	

not persist when we controlled for year of release (by assigning subjects to release cohorts as described in the previous section). This controlling factor is particularly important for the inter-facility comparison because members of the external control group served about one year less time than did members of the two groups assigned to CMYC. Thus, they were released, on average, about a year earlier. The analyses of the complete sample and the sample assigned to cohorts suggest that the initially observed difference in the variable **WKLYWAGE** was due to time of release rather than to group.

We had quarterly wage data for 130 members of the CMYC/SYC and 146 members of the external comparison group. The mean quarterly wages were $946.37 and $825.16 for the CMYC/SYC and external comparison groups, respectively (t-statistic = 1.0181). The critical value for a one-tailed test of the null hypothesis that the wages post-release of these two groups are equal is 1.645 for both of our measures. Thus, we conclude that there is no difference in the post-release wages of these two groups.

The fourth measure of post-release employment is the number of employers in the first (complete) quarter following release. As previously noted, we view this varible as a proxy for employment stability or, perhaps, job satisfaction. The value of this variable ranged from 0 to 4. Results of the comparison of our two study groups on this measure are shown in Table 7.5. As can be seen, again, there was not a significant difference between the two groups.

Table 7.4. Post-Release Activity by Group (CE, PH)

Type Activity	CMYC/SYC CE	External Comparison PH
Positive	66	68
Negative	39	41
Total	99	145
χ^2	0.005	

We also found no difference between the two groups in terms of the industries in which they were working. The results for the variable **INDCODE** are given in Table 7.6. The χ^2 statistic of 2.495 is less than the critical value $\chi^2_{3,0.05} = 7.815$.

The results presented thus far in this section have compared the experimental and internal control groups over the entire study period. As the study was ongoing for more than four years, we reexamined the data after assigning subjects to (1) enrollment cohorts (that is Phase I or Phase II) and (2) release cohorts (released in 1984 or earlier, released in 1985, 1986, 1987). The cohort assignments were an effort to control for (1) program improvements and (2) economic conditions at the time of release. The results of these analyses did not differ from those reported above. Thus, the characteristics of post-release employment for the subjects who received at least some VDS services and those who received no VDS services appear to be similar.

7.3 Discussion and Summary

This Chapter reported on the post-release employment activities of the VDS program participants, the internal controls and the external comparison group. The analyses focused on the second link in the establishment of a "causal relationship" between the Sandhills VDS and a reduction in recidivism. Specifically, this Chapter reports on the effect of vocational training and job development and placement of the VDS on post-release employment. The analyses focused on whether the VDS participants were more likely to find employment post-release

Table 7.5. "First Quarter" Employers by Group (CE, PH)

Number Employers	CMYC/SYC CE	Comparisons
0	35	39
1	60	78
2	29	22
> =3	6	7
Total	130	146
χ^2	2.683	

than members of the internal control group and whether they were "better" employed (in terms of higher wages) than control group members. A second comparison evaluated these same issues, comparing the external control group members with the CMYC/SYC participants.

The comparison of VDS participants with internal controls showed that members of either group were equally likely to be employed post-release. In addition, no significant difference between groups was found in post-release wages. Because post-release employment is to some extent conditional on the the unemployment rate at the time of release, release cohorts were also compared. Again, no significant difference was found either in the number of subjects employed from each cohort or in the wages earned.

Similar analyses were made comparing the post-release employment and wages of Phase I participants, i.e., CMYC/SYC subjects versus Polk/Harnett subjects. Again, there was no significant differencee in the number of subjects employed or in the wages earned by each group.

The limitations in our post-release employment data suggest caution in concluding, on the basis of these analyses, that the VDS does not improve post-release employment. Specifically, the primary source data may be more likely to include information on employed controls and comparisons than on those who were unemployed or re-incarcerated, thus "biasing" the data in favor of these two groups when compared with the experimentals. Additionally, the number of subjects in each group, including the experimental group, who successfully

Table 7.6. First Employment Industry by Group (Control, Experimental)

Industry	CMYC/SYC CE	Comparisons
Construction	18	20
Manufacturing	16	11
Retail Trade	10	14
Other Industry	12	18
Total	58	81
χ^2	2.495	

completed vocational training is small. Recall from Chapter 6 that only about 30 percent of the experimental group successfully completed a vocational program compared with 20 percent of the control group. Although this difference is statistically significant, it also suggests that 70 percent of the experimentals and 80 percent of the controls did not successfully complete any vocational programs. Thus, a large majority of both groups were released without successful vocational program completion.

A final consideration is the labor market available to the subjects in our study. As a group, they have only about a ninth grade education, no work experience, and a criminal record. It may be unrealistic to expect that released offenders will be able to obtain anything other than a minimum wage job post-release. That is, although they may have the skills needed to advance in the job market, it is realistic to assume that thay will have to obtain some seniority and experience in order to have their training "pay off." A longer follow-up period may demonstrate differences by group and skill level.

In conclusion, although the results showed no significant differences in post-release employment activity as a function of VDS participation, the results must be qualified with the recognition that some of the data were biased and the follow-up may not have been long enough to demonstrate any meaningful differences between groups.

8.0 ANALYSIS OF RECIDIVISM DATA

The theoretical model upon which the VDS program is based suggests that three "links" connect the program and its desired goal--a reduction in offender recidivism. These links are shown below.

VDS --> Improved Job Skills --> Better Job --> Reduced Recidivism

In Chapter 6, we presented results suggesting that the VDS program was effective in increasing the vocational skills of participants, as measured by successful vocational program completion. We considered successful vocational program completion as a proxy for improved job skills. The VDS participants were much more likely that the internal control group to have successfully completed one or more vocational programs. Thus, we can conclude that the first link in the causal chain between the VDS program and reduced recidivism was realized. One point should be noted however--only 30 percent of the experimental group successfully completed one or more vocational programs (compared with 20 percent of the internal control group). Thus, 70 percent of the experimental group *was not* successful at vocational training.[40]

[40] These results are valid through July 1986, when the activity data were acquired. As some members of both groups were still in custody at CMYC and SYC, it is reasonable to assume that these numbers understate the percentage of both groups which successfully completed programs. The analyses of program completion by enrollment cohort showed that successful program completion increased over time for both groups, "peaking" for the cohorts enrolled between December 1984 and November 1985.

The vocational activity analyses just discussed pertained to the intra-facility comparison groups (the C and E groups). As members of both the C and E groups received some of the VDS services, we also compared vocational program activity for the inter-facility comparison groups (the CE and PH groups). The measure of vocational program activity was derived from the DOC Inmate file. The educational information contained in this file appears to indicate programs attempted, as these data were most highly correlated with the "vocational programs attempted" data from the CMYC management information system. Considering this a measure of participation (whether "successful" or not) in vocational training, we found that members of the two study groups assigned to CMYC/SYC were much more likely than members of the external comparison group to have participated in one or more vocational programs (62 percent versus 12 percent, respectively). The results of the intra- and inter-facility analyses confirmed the *a priori* hypotheses that (1) the E group would receive more vocational training than the C group, and (2) the CE group would receive more vocational training than the PH group.

The second link in the chain suggests that improved job skills (measured, in our case, by more vocational training) lead to better post-release employment. In Chapter 7, we reported the results of analyses which showed no differences in the characteristics of the post-release employment of the groups. Members of the experimental and internal control groups were equally likely to be employed and were working for the same wages. Similar results were obtained for the comparisons of the CE and PH groups. Thus, it appears that the VDS was not successful in improving the post-release employment of participants--the second link in the chain was not realized. This conclusion, however, must be tempered with the following observations. First, although experimentals were more successful at completing vocational programs than controls, the difference in the percentage of each group successfully completing programs was small (10 percent, representing 30 subjects). Secondly, as was reported in Chapter 5, the study participants assigned to CMYC/SYC were "more serious offenders" than those enrolled in the external comparison group--on average, they were serving longer sen-

Approximately 25 percent of the controls and 45 percent of the experimentals enrolled during this period successfully completed one or more programs (see Table 6.8 and Figure 4 in Chapter 6).

tences for more crimes. Therefore, a finding of "no difference" may suggest that the program was effective, as members of the experimental and control groups were not doing significantly worse than members of the external comparison group in terms of post-release employment. Finally, the VDS program should be evaluated with respect to the overall skill level of its participants and the labor market to which offenders return. The study participants in all groups were, on average, unskilled, with less than a year of work experience, and a ninth grade education. They returned to the labor market as convicted felons. The job opportunities available to them are few, even if they have marketable vocational skills.

Given no difference in the post-release employment of the study groups, the theoretical model would suggest that we would find no difference in the recidivism rates of our evaluation groups. This is, in fact, what was found. Although, again, it must be kept in mind that the controls and experimentals were "more serious offenders" than members of the external comparison group. This chapter discusses our findings with respect to the subjects' criminal activity following release from prison. The analyses were conducted for both the inter-facility comparison groups (the Phase I external comparison, PH, group, and internal control/experimental, CE, groups) and the intra-facility comparison groups (the experimental, E, and internal control, C, groups). Two measures of criminality are considered:

1. Arrest, as reported in Police Information Network (PIN) files, and
2. Re-incarceration in North Carolina, as indicated by Department of Correction (DOC) records.

Re-incarceration includes both return to prison as a result of a parole or conditional release violation, as well as incarceration for a new sentence. The length of the follow-up period ranged from a low of 103 days to a high of 1440 days for the arrest data and from a low of 13 days to a high of 1440 days for the re-incarceration data. The information which was analyzed on these two measures is incidence (for example, subject was/was not rearrested), the number and frequency of arrest post-release, and the timing of recidivism (for example, how many days following the subject's release from prison until re-incarceration?). This final set of an-

alyses uses survival models with explanatory variables in an effort to identify individual characteristics which are related to the timing of recidivism.[41]

The majority of this Chapter presents the results of analyses of the timing of recidivism. These analyses use survival models with explanatory variables.[42] Survival analysis has been widely used in the biostatistics field for the study of the timing until an event, for example the timing of death (failure) of a mouse following exposure to a suspected carcinogen. Similarly, survival analysis is used in engineering studies to assess the time until failure of components. Independent or explanatory variables are included in these models in an effort to identify characteristics which affect survival time. The length of time until recidivism shares a number of important features with these variables from other disciplines. Specifically, survival times are almost always censored, meaning that failure is not observed for all individuals in the sample. In our case, only about 37 percent of the subjects were arrested and about 28 percent were returned to prison by the Summer of 1987, when the last of our data were collected. For the others in our sample, we know only that they had not "failed" by the end of the follow-up period or, equivalently, that their "survival" was longer than the follow-up period. Secondly, the time until recidivism, like the time until death or component failure, is non-negative.

The use of survival analysis in criminal justice studies dates to the early work of Carr-Hill and Carr-Hill (1972). They used an exponential model without explanatory variables to study the reconviction process. Subsequently, Stollmack and Harris (1974) used an exponential model in a study of recidivism. Their specific interest was to discern the effectiveness of various programs and, like Carr-Hill and Carr-Hill, they did not include explanatory variables in their models. Maltz and McCleary (1977) extended the work of Stollmack and Harris by considering a split-population model. The split-population model "divided" the population into two groups,

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[41] Blumstein et al. (1986), Farrington and Tarling (1985), Stollmack and Harris (1974), Sechrest, White and Brown (1979), Harris, Kaylan and Maltz (1981), Maltz (1984), and Schmidt and Witte (1984, 1987) all have argued that a dependent variable that contains information on the timing of recidivism is to be preferred to a simple binary (yes/no) indicator of recidivism. Their arguments are based on the following two premises. First, the timing of recidivism contains valuable information which is statistically inefficient to ignore. Secondly, estimation of the distribution of the length of time until recidivism allows one to predict the rate of recidivism for any desired period after release, not just the follow-up period found in the data being analyzed.

[42] Survival analysis is also called failure-time analysis. We will use the two terms interchangeably.

the first being those who would never return to prison and the second being those who would eventually return. They also used an exponential distribution and did not explicitly include explanatory variables. However, by postulating two groups of individuals, their model implicitly assumed differences between individuals in their study. Maltz and his colleagues (Maltz and McCleary 1978; Maltz, McCleary and Pollock 1979; Harris, Kaylan and Maltz 1981 and Maltz 1984) have continued this work.[43]

Witte and Schmidt (1977) were among the earliest researchers to explicitly include explanatory variables in survival models of the timing of recidivism. The use of the explanatory variables allowed them to study the way in which personal characteristics affect behavior. They considered several different models, each based on a different distribution of the time until recidivism, and found that the lognormal provided the best fit to their data. They have continued this research and, in 1987, reported the results of an extensive study comparing the predictive ability of a variety of survival models of recidivism (Schmidt and Witte 1987).[44] This work considered a variety of parametric models, with and without explanatory variables, as well as a variety of split-population models which allowed the timing of recidivism (for those who would eventually recidivate) to follow different distributions. They concluded that explanatory variables appear to provide more insight into who will eventually recidivate than into the timing of recidivism.

Other recidivism studies which have used survival analysis include the work of Harris and Moitra (1978), who introduced the Weibull distribution (a well-known generalization of the exponential distribution). Cox's proportional hazards model has also been used recently by a variety of researchers, including Barton and Turnbull (1981), Rhodes and Matsuba (1985), Sherman and Berk (1984), and Witte et al. (1982). The proportional hazards model is nonparametric in the sense that no specific distribution is assumed for the timing of recidivism. The proportional hazards model does allow for the introduction of explanatory variables in a parametric form (usually linear).

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[43] For comments on the work of Maltz and his colleagues, see the comments of Miley 1978, Lloyd and Joe 1979, and Stein and Lloyd 1981.

[44] Also see Schmidt and Witte 1979, 1980, and 1984.

As this brief review indicates, survival analysis is becoming an accepted approach to the study of recidivism. The inclusion of explanatory variables in these models allows researchers to identify individual characteristics which are related to the timing of recidivism. Non-parametric models, such as Cox's proportional hazards model or life-table approaches to estimating survival functions, provide valuable guidance in the development of parametric models. Parametric models (models which specify a distribution for the timing of recidivism) are generally viewed as superior to the non-parametric models. As noted by Schmidt and Witte (1987, pp. 32-33), "The frequency of return to crime varies erratically over time, despite the presence of a discernible trend in the hazard rate. To analyze this underlying trend, the data cry out for some sort of smoothing, and this is precisely what parametric methods provide."

This Chapter includes six sections. In the following section, we discuss the data, describing the dependent and independent variables used in the analyses. Section 8.2 presents the results of the incidence data analyses, which primarily show no difference between our subject groups with respect to (1) the proportion of each sample group rearrested/reincarcerated following release, (2) the frequency of arrest post-release, and (3) the timing of arrest post-release. Subsequently, we provide a description of the statistical methodology we employed for the survival analyses (section 8.3). The next two sections present the results of the survival analysis of the timing until rearrest (section 8.4) and the timing until re-incarceration (section 8.5). We conclude the Chapter with a summary and a discussion of the results.

8.1 Recidivism Data

This section provides information on the data used for the recidivism analyses. This information supplements that provided in Chapter 4.

The outcome or dependent variables we have selected for analysis concern arrest and reincarceration following release from prison after enrollment in the study. These variables are:

1. **ARREST**, an indicator variable indicating whether the subject was arrested;
2. **NOARREST**, the number of arrests following release;
3. **ARATE**, the arrest rate following release, calculated as the number of arrests divided by the days free times 100 (days free is the difference between the date the data were collected and the date the subject was released);
4. **ATIME**, the number of days following release until the first arrest;
5. **REINC**, an indicator variable indicating whether the subject was re-incarcerated following release; and
6. **ITIME**, the number of days following release until re-incarceration.

The arrest information was obtained from the Police Information Network in North Carolina. We acquired this data for 603 of the 674 released evaluation subjects August 18, 1987. Information was not available for the other subjects because we did not have FBI numbers for those subjects. The re-incarceration information was obtained from the North Carolina Department of Correction May 20, 1987. Information was available for all of the 674 released subjects.[45] The information on re-incarceration was acquired by searching the inmate records for (1) an indicator of parole/conditional release revocation, and (2) a new inmate record subsequent to the release of the inmate from his enrollment sentence. The date of the revocation or re-incarceration was extracted from these files. Note that we have identified the first incident following release for each of these dependent variables except **NOARREST** and **ARATE**.

The data collection associated with the evaluation allowed us to consider a large number of candidates for explanatory variables in our survival analysis models. The explanatory or independent variables considered for inclusion in the analyses included demographic characteristics, measures of past criminal activity and work history, measures of in-prison behavior, measures of vocational training acquired in prison, and two measures of the environment to which the offender returned upon release (the crime rate and unemployment rate in the county to which the offender was released). These variables, listed alphabetically by category, are as follows:

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[45] We were unable to identify a correct DOC number for 12 subjects. As our information on date of release came from the DOC files, we do not know whether these subjects had been released as of May 20.

1. Socio-demographic variables

   a. **AGEOUT**, the age (in years) at release from prison;

   b. **BETAIQ**, the subject's Beta IQ;

   c. **DRUGS**, a variable indicating whether the individual had a drug problem at the time of incarceration for the enrollment sentence, where 1 = problem and 0 = no problem;

   d. **DRUNK**, a variable indicating whether the individual had an alcohol problem at the time of incarceration for the enrollment sentence, where 1 = problem and 0 = no problem;

   e. **EDUC**, education level (grade level) at the time of incarceration for the enrollment sentence;

   f. **MARITAL**, a variable indicating whether the subject was married at the time of incarceration for the enrollment sentence, equal to 1 if married, 0 otherwise;

   g. **RACE**, a variable indicating whether the subject is white (= 1) or non-white (= 0, primarily black);

   h. **URBAN**, a variable indicating whether the subject's residence at the time of incarceration for the enrollment sentence was urban (= 1) or rural (= 0);

   i. **WORKHIST**, a variable indicating whether the subject's work history was none or unstable (= 0), or stable (= 1).

2. Criminality Variables

   a. **CONDREL**, an indicator variable equal to 1 if the subject was conditionally released from prison and 0 otherwise;

   b. **CRIME**, a variable indicating whether the enrollment sentence was for breaking, entering and larceny (= 1) or for another property offense (= 0);

   c. **NORULE**, number of prison rule violations during the enrollment sentence;

   d. **OFFTYPE**, a variable with the value 0 if the subject was a CYO and a value of 1 if the subject was an RYO.

   e. **PAROLED**, an indicator variable with a value of 1 if the subject was paroled from prison and 0 otherwise;

   f. **PRIORS**, a variable equal to 0 or 1 depending upon whether the subject had a previous (to the enrollment incarceration) incarceration in North Carolina (0 = none; 1 = one or more);

   g. **TIMESVD**, time served for enrollment sentence (days/100);

3. Other Variables

   a. **AVECR**, the average crime rate in the county of release (the average was calculated from semi-annual county crime rates over the period July 1, 1983 through December 31, 1985).

   b. **AVEUNEMP**, the average unemployment rate in the county of release (the average was calculated from monthly unemployment rates over the period June 1983 through December 1985).

   c. **GROUP**, a variable indicating whether the subject was an experimental group member (= 1) or an internal control group member (= 0);

d. **GROUP1**, a variable indicating whether the subject was a member of the experimental or internal control (CE) groups (= 1) or a member of the external comparison (PH) group (= 0);

e. **VOCPGM**, a class variable indicating number of vocational programs attempted during the enrollment sentence, its values are 0 and 1, where 1 indicates at least 1;[46]

These variables were included in our initial specification of the survival models presented in sections 8.4 and 8.5. The next section considers the incidence of arrest and re-incarceration.

8.2 Incidence of Arrest and Re-incarceration

In this section, we examine the occurrence of arrest and re-incarceration following release for the enrollment sentence. Separate analyses are presented for the inter-facility comparison groups (those enrolled prior to November 4, 1984, into either the external comparison group--the PH group--or the experimental or internal control group--the CE group) and the intra-facility comparison groups (those enrolled throughout the enrollment period at CMYC, comprised of the experimentals, the E's, and the internal controls, the C's). The following analyses are discussed:

1. A comparison of the incidence of arrest (**ARREST**) and the number of arrests (**NOARREST**) post-release;
2. A comparison of the rate of arrest post-release (**ARATE**);
3. A comparison of the incidence of re-incarceration (**REINC**).

Section 8.2.1 presents the results for the arrest variables; section 8.2.2 presents the results for the re-incarceration variables. The survival analysis models which examine the variables **ATIME** and **ITIME** are presented in sections 8.4 and 8.5.

8.2.1 Incidence of Arrest

In this section, we consider the following measures of "incidence of arrest": **ARREST, NOARREST** and **ARATE**. Overall, 55 percent of the 357 Phase I releasees for whom we had

[46] This information was derived from the DOC Inmate files since these files provided (a) more current information than the CMYC management information system, and (b) information for all three study groups.

data had been arrested one or more times following release. The corresponding percentage was 32 percent for the internal control (C) and experimental (E) groups. Section 8.2.1.1 presents the results of the inter-facility comparisons. The initial comparison of the CE and PH groups suggested a significant difference in the number of arrests post-release for these two groups; additional analyses, however, suggest that the overall difference was due to a difference in the length of time members of these groups were free. Section 8.2.1.2 presents the results of the intra-facility comparisons. The experimental and control groups did not differ significantly on any of the three measures.

8.2.1.1. Inter-facility comparisons of the incidence of arrest

Overall, 45 percent (163 of 357) of the inter-facility comparisons groups had been arrested one or more times following release; specifically, 45 percent of the CE group (73 of 163) and 46 percent of the PH group (90 of 194) had been arrested one or more times. This difference is not significant at the $\alpha = 0.05$ level (χ^2 statistic = 0.039). Given that members of the two groups were equally likely to have been arrested, we next examined whether there was a difference in the number of arrests post-release. Figure 5 shows the distribution of number of arrests by group (5 indicates 5 or more).[47]

The distributions of number of arrests for the two groups are significantly different at the $\alpha = 0.05$ level (χ^2 statistic = 12.669; critical value for $\chi^2_{5,0.05} = 11.070$). A smaller percentage of the CE group had been arrested twice, while a larger percentage had been arrested three times. A larger percentage of the PH group had been arrested five or more times. As the PH group served, on average, a shorter length of time than did the CE group,[48] the analyses were re-run controlling for time of release. Specifically, the two groups were assigned to four release cohorts: released in 1983 or 1984, 1985, 1986, and 1987. The results revealed that, for those who had been released the longest (i.e., those released in 1983 or 1984), the two groups again differed with respect to the distribution of number of arrests. Specifically, members of

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[47] The number of arrests ranged from 0 to 21; 21 was the largest number for a member of the PH group, 12 was the largest for a member of the CE group.

[48] The PH group served an average of 404 days versus 732 days by the CE group.

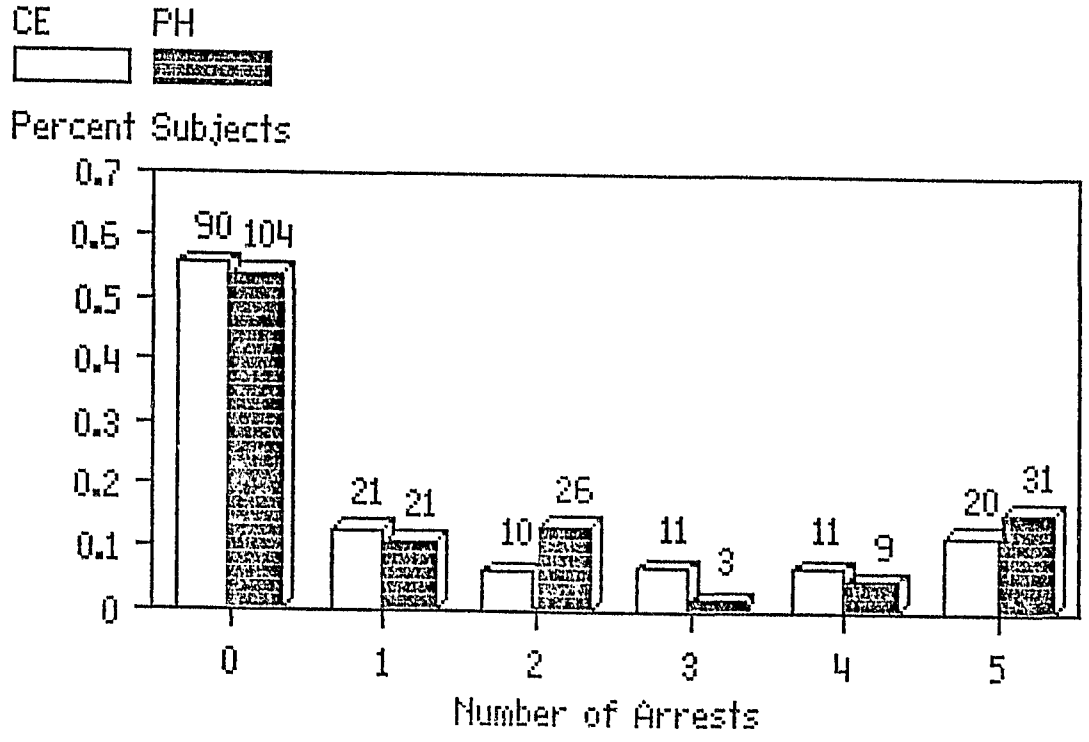

Figure 5. Distribution of number of arrests for Phase I releasees: The figure shows the percent of each group who had been arrested 0, 1, 2, 3, 4, or 5 or more times ("5" indicates 5 or more). The numbers above the bars are the number of subjects .

the CE group were *more likely* to have been arrested one or more times (57 percent versus 48 percent). Additionally, a larger proportion of the CE group was arrested five or more times (20 percent versus 15 percent).[49]

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[49] There were 46 CE and 97 PH group members released prior to December 31, 1984. The χ^2 statistic for the comparison of number of arrests by group was 16.311. The critical value for a $\chi^2_{5,0.05}$ test is 11.070. For each category of arrest, the number of CE and PH group members were, respectively: 0 arrests, 20 and 50; 1 arrest, 5 and 12; 2 arrests, 1 and 13; 3 arrests, 7 and 1; 4 arrests, 4 and 6; and 5 or more arrests, 9 and 15.

The final measure of incidence of arrest we considered was **ARATE**, a variable calculated as the number of arrests divided by the time free (date data collected minus date of release) times 100. This measure weights the number of arrests by the amount of time each subject was exposed to arrest (i.e., was not in prison). The mean **ARATE** for the CE group was 0.1996, implying an average of 0.00196 arrests per day free. The mean **ARATE** for the PH group was 0.2466 (0.00247 arrests per day free). The difference in these two means was not significantly different at the $\alpha = 0.05$ level (t-statistic = -1.0473 with 340.2 degrees of freedom).

The next section examines these arrest measures for the intra-facility comparison groups.

8.2.1.2. Intra-facility comparisons of the incidence of arrest

Overall, 32 percent (127 of 395) of the intra-facility comparisons groups had been arrested one or more times following release; specifically, 31 percent of the E group (64 of 208) and 34 percent of the C group (63 of 187) had been arrested one or more times. This difference is not significant at the $\alpha = 0.05$ level (χ^2 statistic = 0.263). Given that members of the two groups were equally likely to have been arrested, we next proceeded, as in the previous section, to examine the number of arrests post-release (**NOARREST**). Figure 6 shows the distribution of number of arrests by group (5 indicates 5 or more); the distributions of number of arrests for the two groups are not significantly different at the $\alpha = 0.05$ level (χ^2 statistic = 3.734; critical value for $\chi^2_{5,0.05} = 11.070$).[50]

The mean arrest rate for the experimental group was also not significantly different than that of the internal control group. The mean **ARATE** for the E group was 0.2086, implying an average of 0.00209 arrests per day free. The mean **ARATE** for the C group was 0.2117 (0.00212 arrests per day free). The difference in these two means was not significant at the $\alpha = 0.05$ level (t-statistic = -0.0603 with 393 degrees of freedom).

The next section considers the incidence of re-incarceration.

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[50] The number of arrests ranged from 0 to 19.

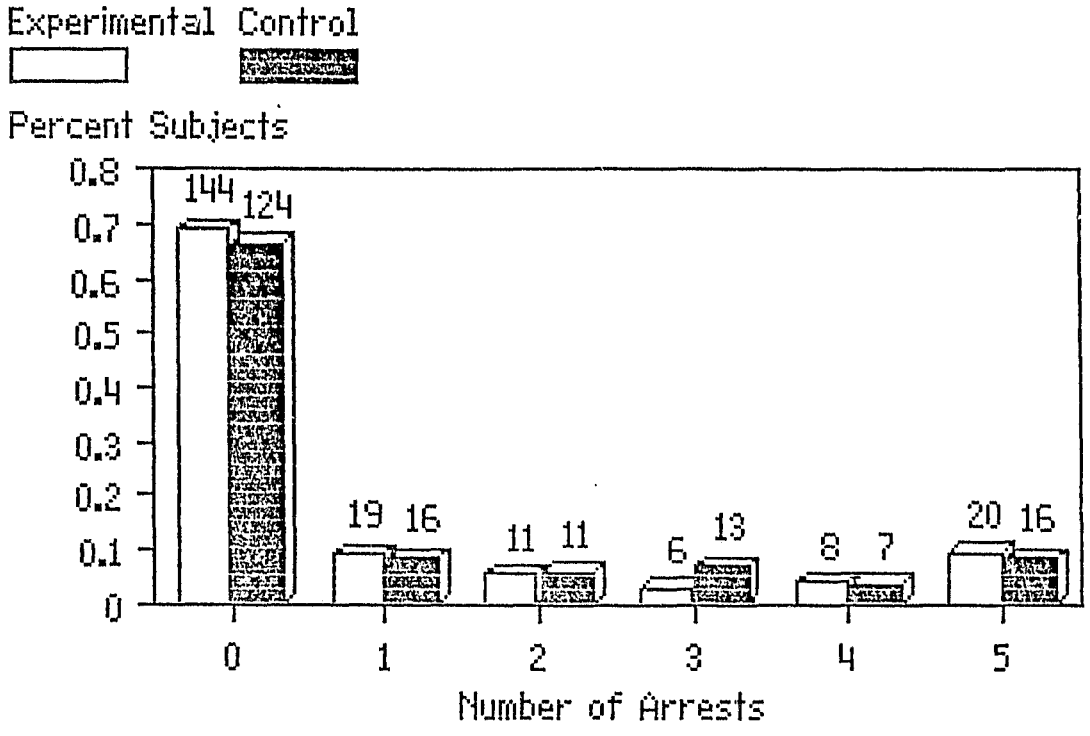

Figure 6. **Number of arrests for released experimentals and controls:** The figure shows the percent of each group who had been arrested 0, 1, 2, 3, 4, or 5 or more times ("5" indicates 5 or more). The numbers above the bars are the number of subjects .

8.2.2 Incidence of Re-incarceration

This section compares the number of subjects in each group who had returned to prison by May 20, 1987 when the data were acquired from the NC DOC. The variable is **REINC**, values are 1 if the individual was re-incarcerated, 0 otherwise. Return to prison includes return as a result of the revocation of conditional release or parole and re-incarceration as a result of a new sentence. Results for the intra-facility comparison are presented first, followed by those for the inter-facility comparison.

Data were available for the 418 released Phase I subjects (196 CE group members and 222 PH group members). Overall 29 percent (123 of 418) had returned to prison before May 20, 1987. Results of this comparison are shown in Table 8.1. As can be seen, 23 percent of the CE group compared with 35 percent of the PH group had returned to prison. The χ^2 analysis for these data revealed a significant difference at the $\alpha = 0.05$ level.

These data were re-examined to determine whether the difference was due to the difference in the length of time members of the two groups had been released. Subjects were assigned to yearly release cohorts (1983-84, 1985, 1986, 1987) and χ^2 statistics for each cohort were calculated. Results are shown in Table 8.2. As can be seen, there was no significant difference in the proportion of each group re-incarcerated, when controlled for year of release. (13 subjects, 8 CE and 5 PH group members, were released between January 1, 1987 and May 20, 1987; none had returned to prison.)

Thus, we conclude that there is no difference in the post-release re-incarceration of the CE and PH groups. This result conforms with the expectations of our theoretical model, namely that given no difference in post-release employment, we would expect no difference in post-release recidivism. Again, we would like to point out that a finding of no difference in these two groups may be indicative of an effect, given that the CE group was "worse" than the PH group when they entered prison for their enrollment (in the evaluation) sentences.

We now turn to the comparison(s) for the inter-facility groups-- the experimentals and internal controls. Overall, 15 percent of these subjects had returned to prison prior to May 20, 1987. The results are shown in Table 8.3. The χ^2 analysis for these data revealed no significant difference at the $\alpha = 0.05$ level.

We also compared the number of subjects re-incarcerated by group and release period, as was done for the intra-facility comparison. These results are presented in Table 8.4; again the χ^2 statistics are insignificant at the $\alpha = 0.05$ level. (52 subjects were released in 1987, period 4; only 1 had returned to prison.)

Table 8.1. Re-incarceration of Phase I Subjects

	CE	PH	Total
Re-incarcerated	46	77	123
Not re-incarcerated	150	145	295
Total	196	222	418
χ^2	5.776		

These results suggest that there was no difference in the incarceration rates of our study groups. Members of the CE group were as likely as members of the PH group to have returned to prison by May 1987. Given that, at enrollment, members of the CE group were serving longer sentences for more offenses than members of the PH group, the finding of no difference may indicate some positive effect of the VDS program (or the "CMYC/SYC experience"). Similarly, members of the experimental group were as likely as members of the internal control group to have returned to prison. The difference in treatment of these two groups may not have been large enough to generate an observable effect even if the VDS program is effective.[51]

8.3 *Statistical Methodology*

The previous section revealed no differences in the incidence of post-release recidivism for the inter-facility comparison groups and the intra-facility comparison groups. Another measure of recidivism is timing (the length of time until first arrest post-release or the length of time until re-incarceration). In sections 8.4 and 8.5, we present the results of survival analyses of the timing of recidivism. This section describes the survival methodology and models used in our study.

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[51] Members of the experimental group were to receive all services; the results in Chapter 6 suggest that this did not happen. Secondly, members of the internal control group received some VDS services, including program participation (admission into classes) equivalent to that of the experimental group. The two groups differed primarily with respect to successful program completion.

Table 8.2. Re-incarceration of Phase I Subjects by Release Cohort

	Period 1		Period 2		Period 3[1]	
	CE	PH	CE	PH	CE	PH
Re-incarcerated	19	48	23	26	4	3
Not re-incarcerated	34	64	65	58	43	18
Total	53	112	88	84	43	18
χ^2	0.733		0.489		*NV*[2]	

1. The periods are: (1) on or before 12/31/84, (2) 1985, and (3) 1986.
2. The χ^2 test is not valid.

We are interested in modeling the length of time until recidivism (arrest or re-incarceration) following release from prison (enrollment sentence), and, specifically, in determining whether the timing of recidivism is different for our various comparison groups (Phase I CE vs PH, and C vs E). More particularly, we are interested in determining whether the experimental subjects have longer survival times. Additionally, we are interested in determining whether individual characteristics such as, for example, race, education, and number of previous convictions can serve as useful predictors of the timing of recidivism.

The length of time until recidivism is a failure time, just as time until death following treatment is a failure time. Failure-time data are characterized by censoring and non-negativity. "Censoring" refers to the fact that not all subjects fail (are arrested or re-incarcerated) prior to the end of the study.[52] Observed failure is a function of the length of the follow-up period, the actual failure of the individual, and the success of the criminal justice system in arresting and prosecuting the offender. Thus, our study suffers from the same limitation as all recidivism studies in that we can observe only conditional failure. That is, we only observe failure conditional on the subject committing a crime, being captured, being prosecuted, and being sentenced. By examining arrest and re-incarceration, we are able to consider two (observable) proxies for the actual recidivism of our subjects.

[52] This type of censoring is referred to Type I censoring (Kalbfleisch and Prentice 1980, p.40).

Table 8.3. Re-incarceration of Experimentals and Controls

	Experimentals	Controls	Total
Re-incarcerated	30	36	66
Not re-incarcerated	202	182	384
Total	232	218	450
χ^2	1.153		

The follow-up period for our subjects ranged from a low of 13 days to a maximum of 1440 days. The large range for follow-up period is a function of our experimental design. Our subjects were identified over a three-year period as they entered the prisons where enrollment was accomplished. Thus, our evaluation cohorts include those who were enrolled during specific periods, rather than those who were released during specific periods. Individuals were released as they completed the appropriate amount of their sentences and, thus, were being released up until the final collection of the data.[53]

The remainder of this section discusses our approach to the analysis of these failure (survival) times.[54] Consider a set of recidivism data that includes the failure time t for each individual. The distribution of t is assumed to be non-negative ($0 \leq t < \infty$) and continuous. The distribution of t can be characterized by its survivor function S(t), which is $S(t) = P(t \geq t^o)$, where t represents the failure time and t^o is some predetermined time of interest (for example, the end of the follow-up period).[55] Thus, the survivor function specifies the probability that a failure time t will be greater than or equal to the value t^o or, equivalently, the proportion of the population who will not have failed by t^o. For example, for our subjects, the survivor function would identify the proportion of the population for whom the first arrest post release is after

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[53] One effect of this experimental design is that 203 subjects were still incarcerated when we conducted our analysis, more than one year after the conclusion of enrollment.

[54] For a comprehensive discussion of failure-time analysis, interested readers are referred to one of the texts on failure-time analysis such as Kalbfleisch and Prentice (1980) or Cox and Oates (1984). For a discussion of survival time models for recidivism applications, readers are referred to Schmidt and Witte 1987.

[55] The survivor function $S(t) = 1 - F(t)$, where F(t) is the cumulative density function for failure time t. Thus, $F(t) = P(t \leq t^O)$. F(t) gives the proportion of individuals who will fail prior to time t^O.

Table 8.4. Re-incarceration of E and C Subjects by Release Cohort

	Period 1		Period 2		Period 3[1]	
	E	C	E	C	E	C
Re-incarcerated	8	11	13	16	8	9
Not re-incarcerated	19	15	56	47	100	96
Total	27	26	69	63	108	105
χ^2	0.926		0.826		0.098	

1. The periods are: on or before December 31, 1984 (period 1), 1985 (period 2), and 1986 (period 3).

some date of interest (for example, August 18, 1987, the date the arrest data were acquired). Corresponding to the survivor function are a probability density function f(t), where

$$f(t) = -\frac{dS(t)}{dt} \tag{8.1}$$

and a hazard function h(t), where

$$h(t) = \frac{f(t)}{S(t)}. \tag{8.2}$$

The hazard rate function h(t) gives the conditional failure rate at t^o, where the failure rate is conditional upon survival until time t^o.

Nonparametric techniques can be used to characterize the empirical distribution and, thus, provide insight into the selection of an appropriate parametric model. We used the Kaplan-Meier product limit estimator (Kalbfleisch and Prentice 1980; Kaplan and Meier 1958). Briefly, the Kaplan-Meier estimate defines a discrete survivor function $\hat{S}(t)$ that is composed of hazard components $\hat{\lambda}_1, \hat{\lambda}_2, ..., \hat{\lambda}_k$, where the $\hat{\lambda}_j$ represent the estimated hazard rate at time t_i, i = 1, 2, ..., k. The estimated hazard rates are defined as:

$$\hat{\lambda}_j = \frac{d_j}{n_j} \tag{8.3}$$

where d_j is the number of events (failures) at time t_j and n_j is the number of subjects at risk just prior to time t_j, j = 1, 2, ..., k.

The Kaplan-Meier estimate of the survivor function is

$$\hat{S}(t) = \Pi_{j|\, t_j < t} \frac{(n_j - d_j)}{n_j} \tag{8.4}$$

where, again, d_j is the number of failure at time t_j and n_j is the number of subjects at risk just prior to time t_j.

A variety of parametric probability models are available for estimation of these functions for a given set of survival/failure rate data. These parametric models assume, *a priori*, the data fit a particular probability distribution. The "success" of the fit depends, of course, on how well the data actually conform to the distributional assumptions of the selected probability model. For example, an exponential distribution assumes a constant hazard rate, while a lognormal distribution assumes a hazard rate that increases and then decreases. We will consider four candidates for our two sets of recidivism data. Distributions which have been used in previous studies of recidivism include the exponential (for example, see Carr-Hill and Carr-Hill 1972, and Stollmack and Harris 1974), the Weibull (Harris and Moitra 1978), the lognormal (Witte and Schmidt 1977), and the loglogistic (Schmidt and Witte 1987). These distributions are defined by one or more parameters. Additionally, explanatory variables can be used as covariates to associate failure rates with individual characteristics. We will discuss characteristics of these four distributions in the following paragraphs.

The exponential distribution is characterized by a constant hazard rate, $h(t) = \lambda$. Constant hazard, in turn, implies that λ is independent of t or that failure is equally likely to occur at any specific time T. An example of a process that exhibits a constant hazard rate is the decay of a radioactive particle. The probability density, survivor and hazard functions for the exponential distribution are, respectively,

$$f(t; \lambda) = \lambda e^{-\lambda t} \tag{8.5}$$

$$S(t; \lambda) = e^{-\lambda t} \tag{8.6}$$

$$h(t; \lambda) = \lambda \tag{8.7}$$

where $\lambda > 0$ is a parameter defining the exponential distribution. For the exponential model, this parameter is equal to the hazard rate.

The Weibull distribution is a generalization of the exponential model and is characterized by two parameters, λ and θ. The probability density and survivor functions are, respectively,

$$f(t; \lambda, \theta) = \lambda\theta(\lambda t)^{\theta-1} e^{-(\lambda t)^{\theta}} \tag{8.8}$$

$$S(t; \lambda, \theta) = e^{-(\lambda t)^{\theta}} \tag{8.9}$$

The hazard function is thus

$$h(t; \lambda, \theta) = \lambda\theta(\lambda t)^{\theta-1} \tag{8.10}$$

The Weibull hazard rate is time dependent. Specifically, the hazard function is monotone, decreasing with respect to time if $0 < \theta < 1$ and monotone increasing with respect to time if $\theta > 1$. If $\theta = 1$, the Weibull model reduces to the exponential model with constant hazard rate λ. An example of a process exhibiting a Weibull distribution is patient survival following surgery.

The third distribution of interest here is the lognormal. A random variable has a lognormal distribution if the log of the variable is normally distributed. The density function is

$$f(t; \lambda, \theta) = \sqrt{(2\pi)}\ \theta t^{-1} \exp\left(\frac{-\theta^2(\log \lambda t)^2}{2}\right) \tag{8.11}$$

and the survivor function is

$$S(t; \lambda, \theta) = 1 - \Phi(\theta \log \lambda t) \tag{8.12}$$

where Φ is the standard normal cumulative density function. The hazard function is

$$h(t; \lambda, \theta) = \frac{f(t; \lambda, \theta)}{S(t; \lambda, \theta)} \tag{8.13}$$

The lognormal hazard function increases from 0 with respect to time, reaches a single maximum, and then decreases, approaching 0 as t becomes large.

The final distribution we will consider is the log-logistic distribution. A log-logistic distribution is appropriate if the log of the random variable has a logistic distribution. The density function is

$$f(t; \lambda, \theta) = \frac{\lambda\theta(\lambda t)^{\theta-1}}{[1 + (\lambda t)^{\theta}]^2} \tag{8.14}$$

and the survivor function is

$$S(t; \lambda, \theta) = \frac{1}{[1 + (\lambda t)^{\theta}]} \tag{8.15}$$

Thus, the hazard function is

$$h(t; \lambda, \theta) = \frac{\lambda\theta(\lambda t)^{\theta-1}}{[1 + (\lambda t)^{\theta}]} \tag{8.16}$$

Again, both λ and θ must be greater than zero. The hazard function is monotone decreasing from ∞ if $0 < \theta < 1$ and montone decreasing from λ if $\theta = 1$. If $\theta > 1$, the log-logistic hazard function increases with respect to time to a single maximum and then decreases. Thus, if $\theta > 1$, its shape is quite similar to the shape of the lognormal hazard function.

The parametric models described above assume that the hazard rate is the same for all subjects, in other words these simple models assume a homogeneous population. This assumption is not valid for our subjects. Some individuals quickly return to crime (and, thus, to encounters with the criminal justice system), while others may return to crime only after exploring and failing at legitimate careers. Others, of course, desist from crime the remainder of their lives.[56] The failure rates are, therefore, dependent on individual characteristics of our subjects. These characteristics are accommodated by using explanatory variables in the survival models, in other words by assuming that the parameters described for the simple models (for example, λ, θ) are functions of explanatory variables. Consider a vector of explanatory variables $z = (z_1, z_2, ..., z_s)$. The explanatory variables may include information on individual characteristics such as age, education, and race. A variable indicating treatment group may also be included. For example, for the exponential model (eq. 8.7), we would have

[56] The previously mentioned split population models attempt to take this form of behavior into account. We will not develop split population models for our data.

$$h(t; z) = \lambda e^{z\beta} \tag{8.17}$$

where λ is the constant exponential hazard rate and $z\beta$ is a linear function. This model implies that the log failure rate is a linear function of the covariates z. Similar models can be formulated for the Weibull, lognormal, and log-logistic models.

The method of maximum likelihood was used to solve for the parameters of the models.[57] The likelihood function is

$$\mathcal{L} = \prod_{i=1}^{N} f(t_i)^{C_i} S(t_i)^{1 - C_i} \tag{8.18}$$

or, equivalently, the log of the likelihood function is considered:

$$L = \sum_{i=1}^{N} \{C_i \ln f(t_i)\} + \{(1 - C_i) \ln S(t_i)\} \tag{8.19}$$

where $f(t_i)$ is the probability density function and and $S(t_i)$ is the survivor function, t_i is the time (either failure or censoring time), and C_i indicates whether t_i is a failure ($C_i = 1$) or censoring ($C_i = 0$) time. Note that C_i assures that only the probability density or survivor function enters the likelihood model for each subject i, i = 1, 2, ..., N. The likelihood function depends on the unknown parameters of the probability and survivor functions. The maximum likelihood estimator (MLE) of the parameters is defined as the values of the parameters which maximize the log likelihood function (eq. 8.19). Thus, intuitively, the MLE is the value of the parameters which make the observed outcomes most likely. For large samples, maximum likelihood estimates are consistent, asymptotically efficient, and asymptotically normally distributed--all desirable statistical properties.

The approach to the analysis of our two data sets is as follows. Basically, we explore the data using nonparametric techniques to provide insight for the development of our parametric models. The approach is as follows:

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[57] All analyses were conducted using *SAS*^{R}.

1. Use the Kaplan-Meier method to estimate survivor functions for our groups. This approach makes no assumption about the underlying probability distribution of survival, nor does it allow for the influence of explanatory variables on the survival rates.

2. Compare the nonparametric survival curves for the (a) inter-facility comparison and (b) intra-facility comparison to determine whether the survivor curves differ within each pair of study groups (for example, is the survival of the experimentals significantly better (longer) then that of the controls?). The generalized Savage or log-rank test is used for these analyses.

3. Apply log-rank tests as a non-parametric test of association between survival times and our set of explanatory variables. This technique allows identification of those characteristics most likely to affect survival time.

4. Estimate parametric models with explanatory variables. These models are estimated for the exponential, Weibull, lognormal, and log-logistic distributions.

8.4 Survival Analysis of Arrest Data

This section presents the survival analyses of the timing of arrest (variable **ATIME**) for the inter-facility comparison groups (section 8.4.1) and the intra-facility comparison groups (section 8.4.2). **ATIME** is equal to either the time until first arrest following release from prison or, for individuals not arrested between the time they were released and August 18, 1987, the length of the follow-up time. The variable is measured in days.

The first step was to estimate the non-parametric Kaplan-Meier estimates of the survival distribution functions. The log-rank test statistics revealed no difference in the survival functions of (a) the CE and PH groups, and (b) the E and C groups. Subsequently, non-parametric log-rank tests were used to determine the association between survival time and individual characteristics (covariates). The variables with log-rank test statistics significant at the $\alpha = 0.20$ level were identified as candidates for inclusion in the the parametric models. The final analyses involved estimating exponential, Weibull, lognormal and log-logistic survival models for our two (inter- and intra-facility) comparison groups.

8.4.1 Inter-facility Comparisons of the Time until First Arrest

This section analyzes the arrest-time data available for the Phase I cohort--the experimental and internal control group members enrolled on or before November 4, 1984, (the CE group) and the external comparison group (the PH group). Section 8.4.1.1 presents the results of the non-parametric analyses. Section 8.4.1.2 presents the results for the parametric models.

8.4.1.1 Non-parametric models

Life table estimates of the survival distribution function were calculated using the Kaplan-Meier method (all analyses were conducted using *SAS*^{R}). The results are shown in Figure 7. The life table estimates are included in the Appendix. As can be seen, the survival rate declines approximately linearly for the first 600 days after release after which it remains constant. The survival rate at the 600th day is 53 percent (standard error of 4 percent) for the CE group and 61 percent (standard error 4 percent) for the PH group. These estimates can be interpreted as follows: 600 days after release, 53 percent of the CE group and 61 percent of the PH group have not been arrested. The log-rank test statistic was 0.6252. This statistic measures the equality of the the CE and PH survival time distributions and is distributed χ^2_1. Critical values for $\chi^2_{1,0.05}$ and $\chi^2_{1,0.10}$ are 3.841 and 2.706, respectively. Thus, we conclude that the survival distribution functions for these two groups are the same or, equivalently, that the time until first arrest is the same for the two groups. **GROUP1** (that is VDS program participation) does not appear to be related to the timing of post-release arrest. This finding should be considered, however, in the context that the CE group was composed of more serious offenders at enrollment.

Next we tested each of the 20 explanatory variables listed in section 8.1 for association with survival time. The results are given in Table 8.5.

The log-rank statistics were significant at the $\alpha = 0.05$ level for 7 of these 20 variables. With the exception of **MARITAL**, the significant variables were all measures of criminality. The test

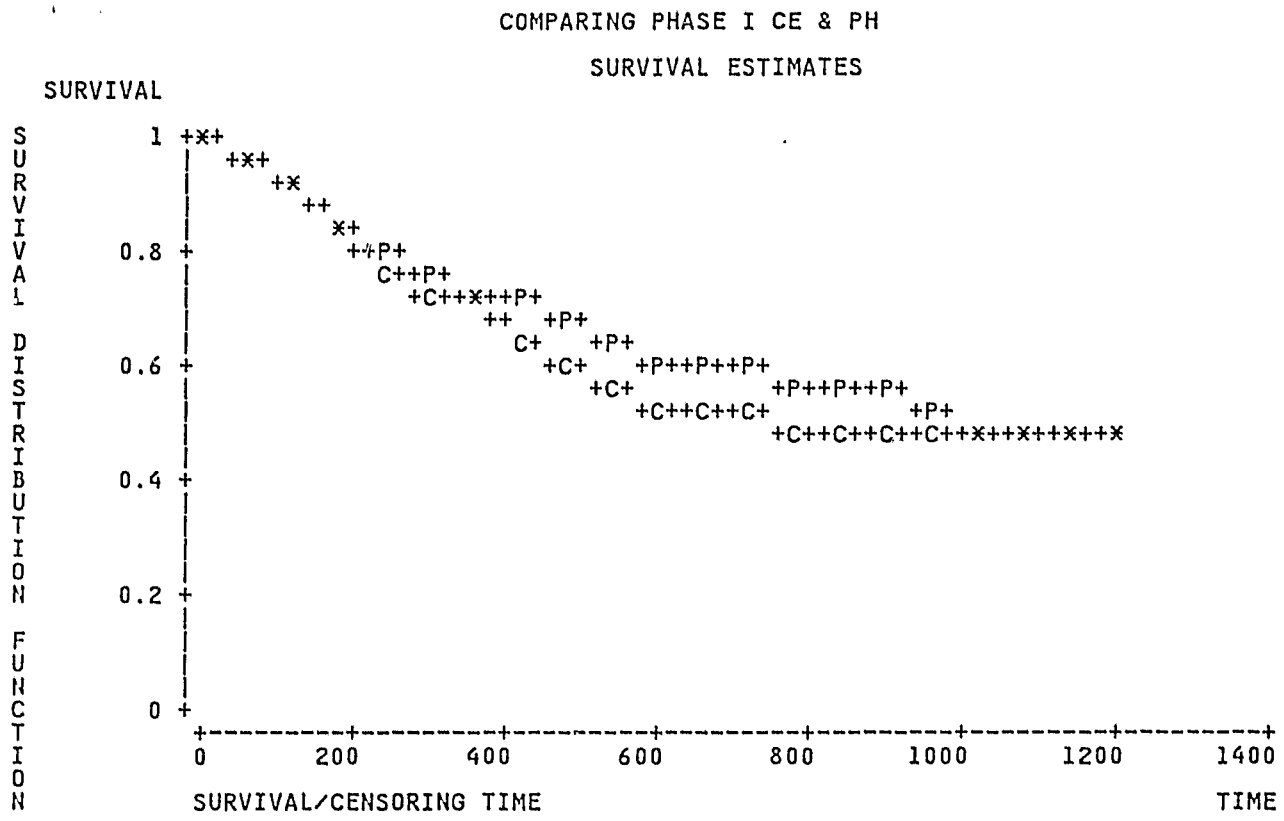

Figure 7. Survival distribution functions for the intra-facility comparison groups: The figure shows the Kaplan-Meier life table survivor function estimates for the experimental/internal control (C) and the external comparison (P) groups.

statistics which were significant at the $\alpha = 0.05$ level imply that survival time is longer for those:

1. With no previous incarcerations (i.e., **PRIORS** = 0);
2. With 0 (or few) rule violations (i.e., small values for **NORULE**);
3. Who were conditionally released (**CONDREL** = 1);
4. Returning to a county with a low crime rate (**AVECR** is small);
5. Who were sentenced as a committed youthful offender (**OFFTYPE** = 1);
6. Who are married (**MARITAL** = 1); and
7. Who were **not** paroled (**PAROLED** = 0).

Table 8.5. Non-parametric Tests of Explanatory Variables for ATIME Phase I (CE and PH) Releasees

Variable	Test Statistic	χ^2	$P - value^1$
PRIORS	22.8265	22.5715	0.0001
NORULE	133.9	13.0769	0.0003
CONDREL	-18.8380	12.1298	0.0005
AVECR	24.5872	6.7749	0.0092
OFFTYPE	14.3810	6.1121	0.0134
MARITAL	-9.5140	4.8657	0.0274
PAROLED	12.3261	4.6292	0.0314
AVEUNEMP	-34.9490	1.7144	0.1904
DRUNK	5.7273	1.1082	0.2925
WORKHIST	-4.9441	0.8608	0.3535
TIMESVD	28.7560	0.6088	0.4353
BETAIQ	77.2933	0.3961	0.5291
URBAN	2.9317	0.2724	0.6017
GROUP1	2.8397	0.2517	0.6159
VOCPGM	2.1957	0.1692	0.6808
EDUC	6.2944	0.1376	0.7106
RACE	-1.6820	0.0856	0.7699
CRIME	-1.4670	0.0799	0.7775
DRUGS	-1.4472	0.0661	0.7971
AGEOUT	1.9151	0.0089	0.9248

1. Significance level at which the test statistic would be significant

An eighth variable, **AVEUNEMP**, was significant at the $\alpha = 0.20$ level.[58] These eight variables will comprise our **log-rank specification** for the parametric models discussed in the next section.

The log-rank tests revealed no significant relationship between the number of vocational programs and survival time. This finding *may* be attributable to the weakness of this measure of vocational training. The values for this variable were derived from the DOC records. As we noted in Chapter 6.3, this variable appears to reflect programs attempted, not programs completed or successfully completed. Thus, the insignificance of the test statistic indicates no relationship between survival time and attempting one or more vocational programs while in prison. A better proxy of vocational skill would be successful program completion. Unfortunately, we had no information to support such an analysis.

[58] The negative test statistic implies that survival time was longer for those who returned to counties with low unemployment rates (at the $\alpha = 0.20$ level of significance).

8.4.1.2 Parametric models

The non-parametric tests discussed in the previous section allowed us to examine the influence of various factors on the time until first arrest for the Phase I subjects without making any assumptions about the distribution of survival time. In this section, we develop parametric models of time until first arrest. The "candidates" for the distribution are the exponential (eq. 8.5), the Weibull (eq. 8.8), the lognormal (eq. 8.11), and the log-logistic (eq. 8.14) distributions, where we assume that the parameter(s) of the distribution are functions of explanatory variables. The hazard rate for each of these models assumes a specific (different) form. Specifically, the hazard rate for a random variable distributed exponentially is constant (eq. 8.7), while the hazard rate for a variable with a Weibull distribution is monotone decreasing, constant or increasing depending upon the values of the parameters (eq. 8.10). A random variable with a lognormal distribution has a hazard rate which first increases and then decreases (eq. 8.13). Finally, the hazard rate for a variable distributed log-logistically is either monotone decreasing from ∞ or λ, or increases with respect to time to a single maximum and then decreases (depending upon the values of the parameters; eq. 8.16).

The estimated hazard function for the Phase I inter-facility comparison groups is shown in Figure 8.[59] As can be seen, the hazard rate increases and then decreases with respect to time. This distribution would suggest that the lognormal (or, perhaps, the log-logistic) distribution would be the most appropriate of our four candidates for modeling the distribution of time until first arrest.

We estimated the full model (the variables listed in Table 8.5 and described in section 8.1) using each of the four distributions. The log of the likelihood function was larger for the lognormal distribution, again suggesting that this distribution is more appropriate.[60] Results of the estimation of the lognormal model are given in Table 8.6. As can be seen, only four coefficients (and the constant) are significant at the $\alpha = 0.05$ level. The results suggest that

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[59] The hazard function was estimated by the Kaplan-Meier method.

[60] The log of the likelihood function was -314.6800 for the lognormal model, -316.5718 for the Weibull model, -315.5042 for the log-logistic model, and -317.4569 for the exponential model.

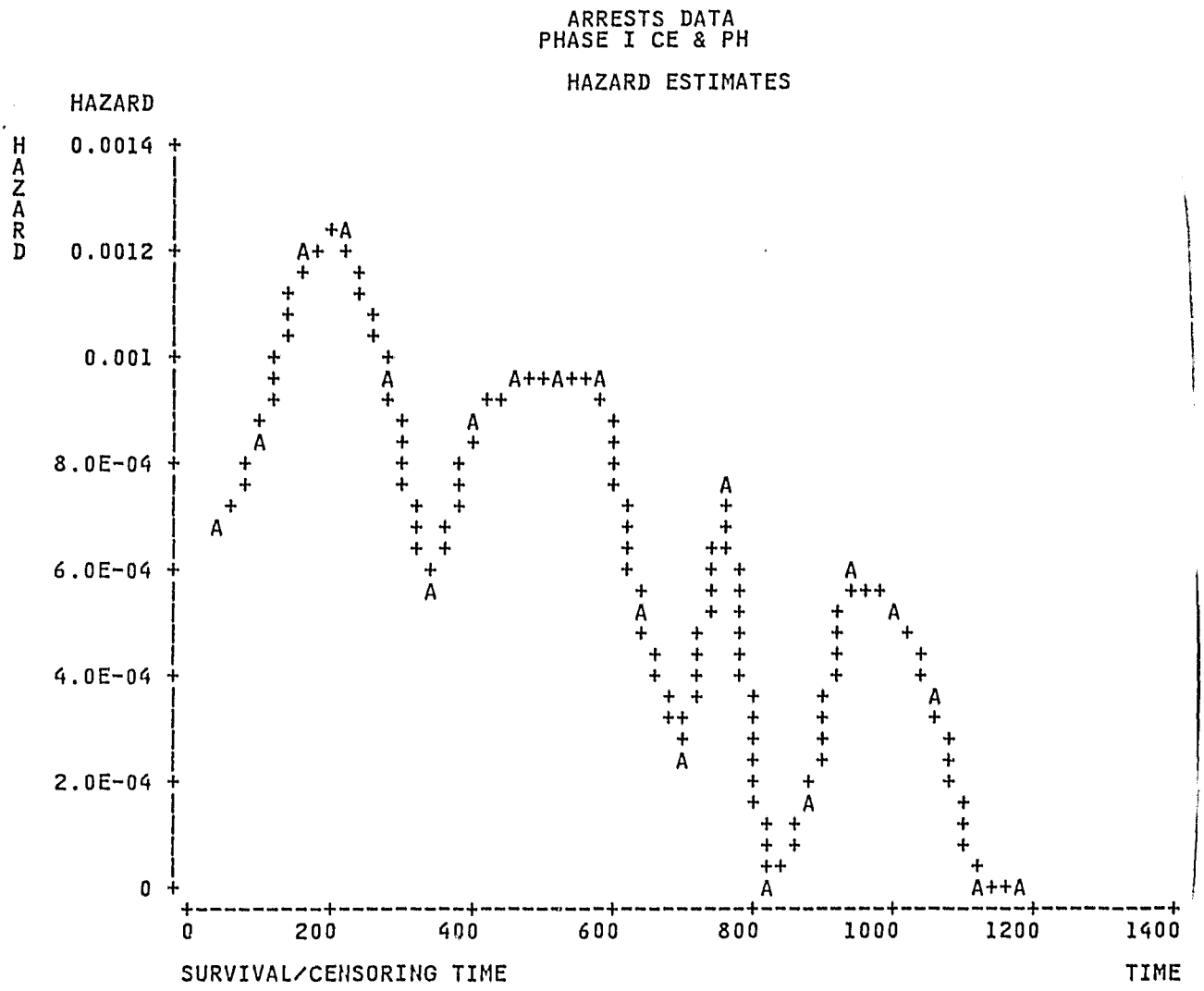

Figure 8. Estimated hazard rates for time until first arrest: The figure shows the Kaplan-Meier hazard estimates for the released members of the inter-facility comparison groups. Time is measured in days.

the time until first arrest is longer for those with no previous incarcerations (**PRIORS** = 0), with few rule violations (**RULENO** small), who were conditionally released (**CONDREL** = 1) to to a county with a low average crime rate (**AVECR** small). An additional coefficient, **MARITAL**, was significant at the $\alpha = 0.10$ level, suggesting that the time until first arrest was longer for those who were married (**MARITAL** = 1).

Table 8.6. Lognormal Model of Time Until First Arrest
Phase I (CE and PH) Releasees

Variable	Model *Specification*[1]		
	Original	Log Rank	Reduced
	Coefficient	Coefficient	Coefficient
CONSTANT	5.5346[2]	6.2443[2]	5.8588[2]
	(1.6150)	(0.4076)	(1.2958)
PRIORS	−0.7103[2]	−0.7799[2]	−0.7049[2]
	(0.2047)	(0.1904)	(0.1950)
NORULE	−0.0681[2]	−0.0605[2]	−0.0573[2]
	(0.0241)	(0.0204)	(0.0210)
CONDREL	0.7224[2]	0.7414[2]	0.7938[2]
	(0.2954)	(0.2712)	(0.2272)
AVECR	−0.3123[2]	-0.1303	-0.2758
	(0.1124)	(0.1003)	(0.1035)
OFFTYPE	-0.1573	0.0955	
	(0.2475)	(0.2271)	
MARITAL	0.5604[3]	0.4224[3]	0.5142[3]
	(0.2880)	(0.2586)	(0.2764)
PAROLED	0.0213	0.0819	
	(0.2701)	(0.2423)	
AVEUNEMP	0.0514	0.1028[2]	0.0512
	(0.0399)	(0.0376)	(0.0395)
DRUNK	-0.2940		-0.3171
	(0.2319)		(0.1470)
WORKHIST	-0.0802		
	(0.2132)		
TIMESVD	0.0148		
	(0.0365)		
BETAIQ	0.0047		
	(0.0089)		
URBAN	0.0647		
	(0.2042)		
GROUP1	-0.0768		
	(0.2366)		
VOCPGM	0.1765		
	(0.2258)		
EDUC	-0.0888		-0.0585
	(0.0672)		(0.0616)
RACE	-0.2373		
	(0.2206)		
CRIME	0.1576		
	(0.2056)		
DRUGS	0.3087		0.2490
	(0.2216)		(0.2173)
AGEOUT	0.0881		0.0802
	(0.0581)		(0.0520)
ln L	**-314.6800**	**-389.5721**	**-319.8055**

1. Numbers in parentheses are standard errors.
2. Significant at the $\alpha = 0.05$ level.
3. Significant at the $\alpha = 0.10$ level.

Also included in Table 8.6 are the coefficients estimated using the log-rank specification (the eight variables significant at the $\alpha = 0.20$ level using the log-rank test). The results are essentially consistent with those from the fully specified lognormal model. Specifically, the coefficients on the variables **PRIORS, NORULE** and **CONDREL** are significant at the $\alpha = 0.05$ level and **MARITAL** is significant at the $\alpha = 0.10$ level. Two differences are apparent with respect to the significance of the coefficients. The coefficient of **AVECR** is significant ($\alpha = 0.05$) in the original model and is not significant in the model using the log-rank specification. Conversely, the coefficient of **AVEUNEMP** is significant in the log-rank specification model and not in the original specification. The log-rank specification model includes only 8 independent variables (plus the constant term) compared with 21 independent variables (plus constant) in the original specification. Thus, we have "dropped" 13 independent variables in the log-rank specification--none of which was significant at the $\alpha = 0.05$ level. As can be seen, however, the log likelihood for the log-rank specification model is much smaller than for the original specification. This difference is significant at the $\alpha = 0.05$ level, implying that some of the variables dropped from the model are, perhaps, contributing jointly to the explanatory power of the model.[61]

The final set of coefficients in Table 8.6 is for a lognormal model which includes all variables whose coefficients were significant at the $\alpha = 0.20$ level in the original specification. The results are the same as for the original specification. Specifically, the variables **PRIORS, NORULE, CONDREL,** and **AVECR** appear to be significantly related to the timing of the first arrest. Additionally, the log likelihood value is not significantly different than that for the original specification (although we have "dropped" 11 independent variables).[62]

Thus, we have been successful in identifying several characteristics which appear to be related to the timing of the first arrest post release. Individuals who have been incarcerated at

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[61] The appropriate test statistic is the difference between the log likelihood values of the two models multiplied by 2; this statistic is distributed χ^2 with R degrees of freedom, where R is the number of variables "dropped" from the model (technically the number of coefficients restricted to a value of 0). Thus, the test statistic is 149.7842, which is distributed χ^2_{13} ; the critical value of a $\chi^2_{12,0.05}$ test is 21.026.

[62] The test statistic is 10.2510, which is less than the $\chi^2_{10,0.05}$ critical value of 18.307.

least twice, who committed a "large" number of rule violations while incarcerated for their enrollment sentence, who were paroled or unconditionally discharged, and returned to a county with a "high" crime rate were likely to be arrested sooner following release than those for whom the enrollment sentence was the first incarceration, who committed few rule violations, were conditionally discharged, and returned to a county with a "low" crime rate.

In the next section, we apply the same methodological techniques to the intra-facility comparison groups.

8.4.2 Intra-facility Comparisons of the Time until First Arrest

This section analyzes the arrest-time data available for the experimental (E) and internal control (C) group members. Section 8.4.2.1 presents the results of the non-parametric analyses. Section 8.4.2.2 presents the results for the parametric models.

8.4.2.1 Non-parametric models

Life table estimates of the survival distribution function were calculated using the Kaplan-Meier method; the results are shown in Figure 9 (the life table estimates are included in the Appendix). As can be seen, the survival rate declines approximately linearly for the first 600 days after release after which it remains relatively constant. The survival rate at the 600th day is 63 percent (standard error of 4 percent) for the E group and 56 percent (standard error of 5 percent) for the C group. Thus, 600 days after release, 63 percent of the experimental group and 56 percent of the control group had not been arrested. As can be seen, the "survival" of the experimental group appears to be better than that of the control group. The difference in the timing of first arrest for the two groups is not significant however, the log-rank test statistic was 1.0269.[63] Thus, we conclude that the survival distribution functions for these two groups are the same or, equivalently, that the time until first arrest is the same for the two

[63] This statistic measures the equality of the the E and C survival time distributions and is distributed χ^2_1. Critical values for $\chi^2_{1,0.05}$ and $\chi^2_{1,0.10}$ are 3.841 and 2.706, respectively.

groups. **GROUP** (that is VDS program participation) does not appear to be related to the timing of post-release arrest.

Next we tested each of the explanatory variables listed in section 8.1 for association with survival time. The results are given in Table 8.7.

The log-rank statistics were significant at the $\alpha = 0.05$ level for 4 of these 20 variables. The significant variables were all measures of criminality. The test statistics which were significant at the $\alpha = 0.05$ level imply that the time to first arrest is longer for those:

1. With no previous incarcerations (i.e., **PRIORS** = 0);
2. With 0 (or few) rule violations (i.e., small values for **NORULE**);
3. Who were conditionally released (**CONDREL** = 1);
4. Who were **not** paroled (**PAROLED** = 0).

Additionally, **AVEUNEMP** and **OFFTYPE** were significant at the $\alpha = 0.10$ level. Two variables which were significant at the $\alpha = 0.05$ level for the intra-facility comparison groups were not significant at any reasonable significance level for the inter-facility groups. These variables were **AVECR** and **MARITAL**. The variables **PRIORS, NORULE, CONDREL, PAROLED, AVEUNEMP, OFFTYPE, EDUC**, and **TIMESVD** will comprise the "log-rank specification" for the independent variables for the parametric models discussed in the next section.

8.4.2.2 Parametric models

The non-parametric tests discussed in the previous section allowed us to examine the influence of various factors on the time until first arrest for the intra-facility subjects without making any assumptions about the distribution of survival time. In this section, we develop parametric models of time until first arrest. The "candidates" for the distribution are the same as were considered in section 8.4.1.2 for the inter-facility comparison groups: exponential (eq. 8.5), the Weibull (eq. 8.8), the lognormal (eq. 8.11), and the log-logistic (eq. 8.14) distributions, where we assume that the parameter(s) of the distribution are functions of explanatory variables.

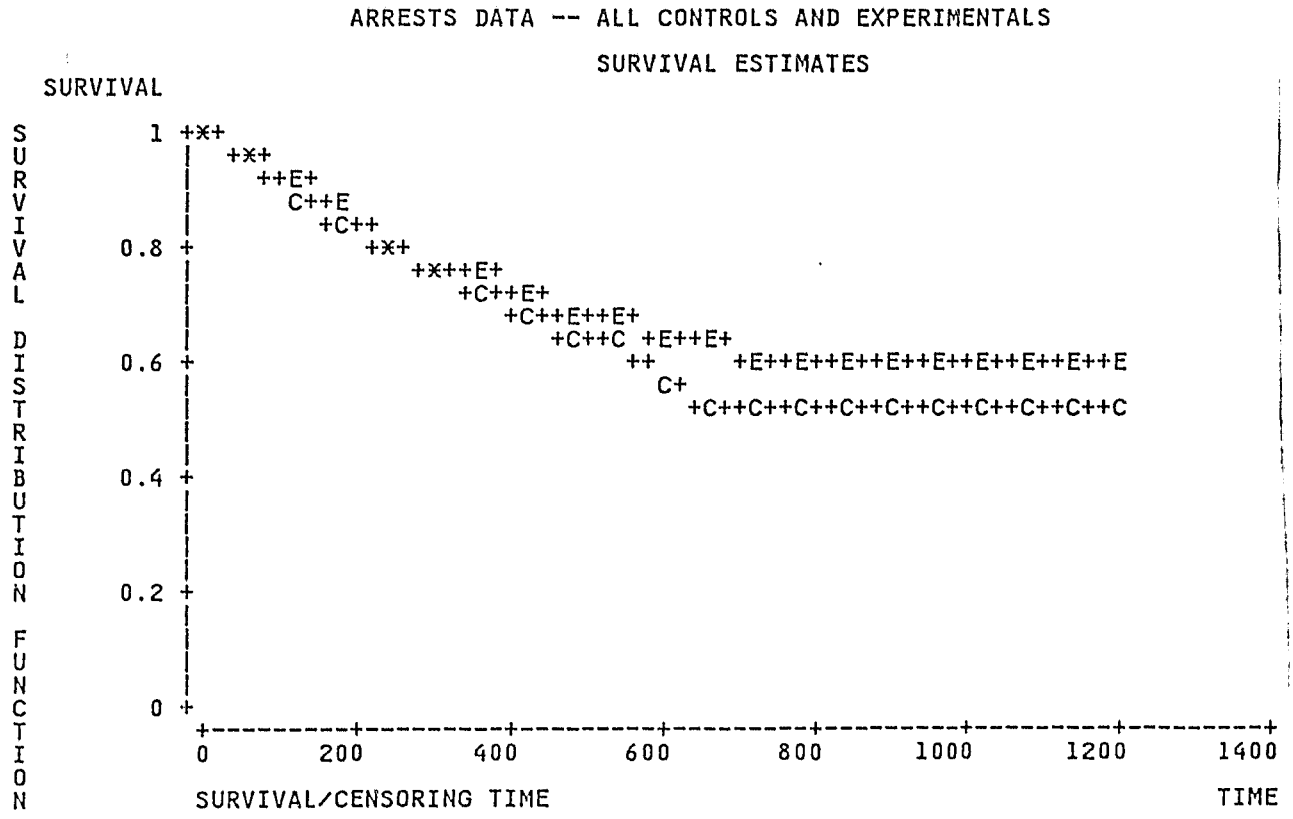

Figure 9. Survival distribution functions for the intra-facility comparison groups: The figure shows the Kaplan-Meier life table survivor function estimates for the experimental (E) and internal control (C) groups.

The estimated hazard function for the Phase I inter-facility comparison groups is shown in Figure 10.[64] As can be seen, the hazard rate increases and then decreases with respect to time. This distribution would suggest that the lognormal (or, perhaps, the log-logistic) distribution would be the most appropriate of our four candidates for modeling the distribution of time until first arrest.

We estimated the full model (the variables listed in Table 8.7 and described in section 8.1) using each of the four distributions. The log of the likelihood function was larger for the

[64] The hazard function was estimated by the Kaplan-Meier method.

Table 8.7. Non-parametric Tests of Explanatory Variables for ARATE
Experimental and Internal Control Releasees

Variable	Test Statistic	χ^2	$P - value^1$
PRIORS	17.7177	15.6764	0.0001
NORULE	83.0899	9.0275	0.0027
CONDREL	-12.4193	6.7577	0.0093
PAROLED	10.0279	3.9446	0.0470
AVEUNEMP	-40.3304	2.8992	0.0886
OFFTYPE	8.4215	2.7389	0.0979
EDUC	-21.2136	1.9535	0.1622
TIMESVD	42.7718	1.9087	0.1671
URBAN	6.2186	1.5693	0.2103
GROUP	-4.9053	0.9365	0.3332
DRUNK	4.0994	0.6594	0.4168
RACE	-4.0060	0.6289	0.4278
AVECR	5.4336	0.4542	0.5003
DRUGS	2.5036	0.2504	0.6168
CRIME	-2.0204	0.2044	0.6512
MARITAL	-0.9434	0.1590	0.6900
BETAIQ	-37.6270	0.1296	0.7188
WORKHIST	-1.5753	0.1199	0.7292
AGEOUT	-7.7690	0.1171	0.7322
VOCPGM	-0.8445	0.0312	0.8599

1. Significance level at which the test statistic would be significant

lognormal distribution, again suggesting that this distribution is more appropriate.[65] Results of the estimation of the lognormal model are given in Table 8.8. As can be seen, only **PRIORS** (and the constant) is significant at the $\alpha = 0.05$ level. This result suggests that the time until first arrest is longer for those with no previous incarcerations (**PRIORS** = 0). An additional coefficient, **NORULE**, was significant at the $\alpha = 0.10$ level, suggesting that the time until first arrest was longer for those with few rule violations (**NORULE** "small").

Also included in Table 8.8 are the coefficients estimated using the log-rank specification (the eight variables significant at the $\alpha = 0.20$ level using the log-rank test). The results are essentially consistent with those from the fully specified lognormal model. The coefficients on the variables **PRIORS** and **CONDREL** are significant at the $\alpha = 0.05$ level and **NORULE** is significant at the $\alpha = 0.10$ level. Consistent with previous findings, the signs of these coefficients

[65] The log of the likelihood function was -285.9870 for the lognormal model, -289.2979 for the Weibull model, -289.7123 for the log-logistic model, and -287.9744 for the exponential model.

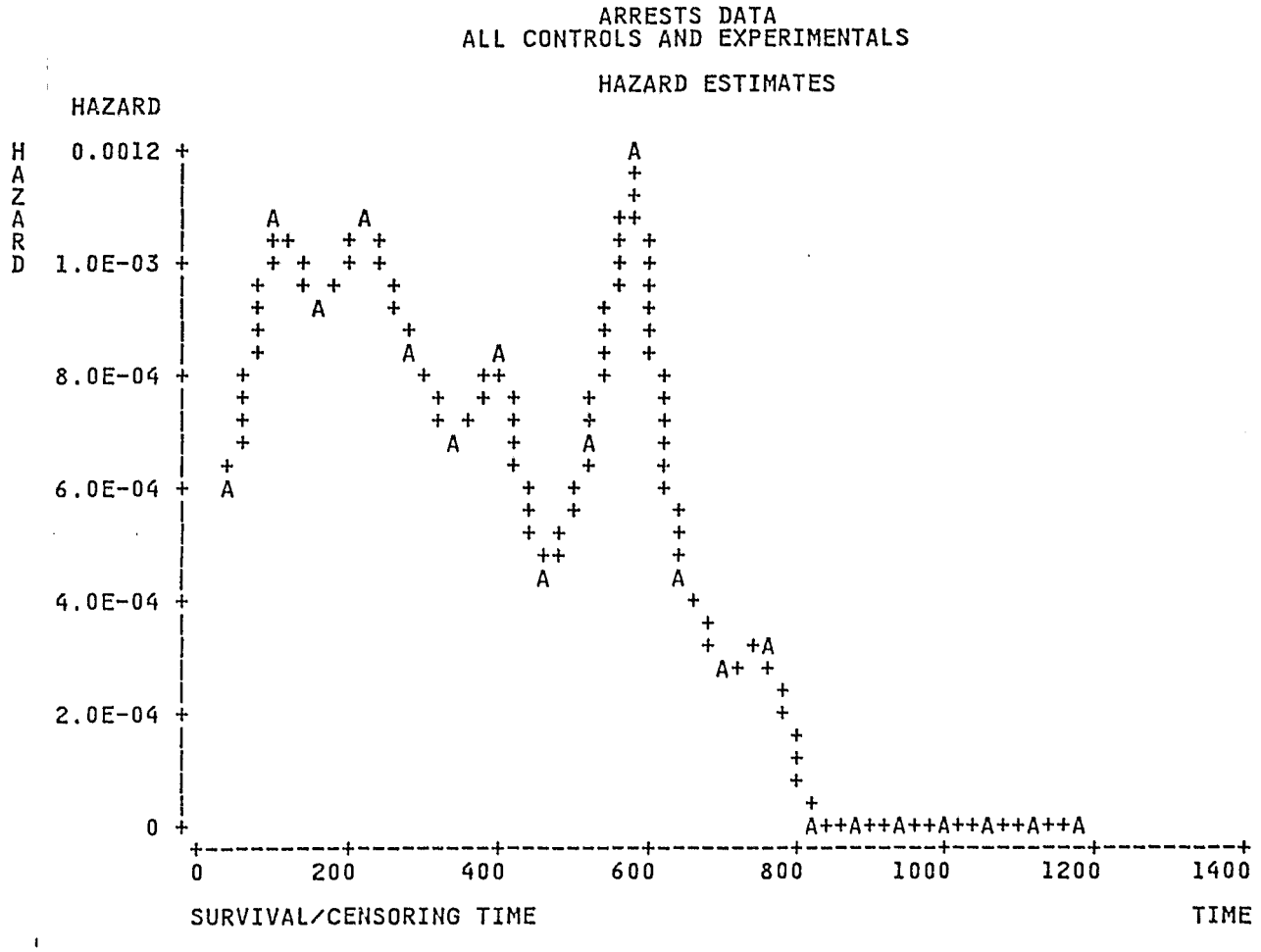

Figure 10. Estimated hazard rates for time until first arrest: The figure shows the Kaplan-Meier hazard estimates for the released members of the intra-facility comparison groups. Time is measured in days.

suggest that the time until first arrest post release is longer for those with only one (the enrollment) sentence, who were conditionally released, and who had few rule violations while serving their enrollment sentence. The log-rank specification model includes only 8 independent variables (plus the constant term) compared with 20 independent variables (plus constant) in the original specification. Thus, we have "dropped" 12 independent variables in

Table 8.8. Lognormal Model of Time Until First Arrest
Released Experimentals and Internal Controls

	Model *Specification*[1]		
	Original	Log-Rank	Reduced
Variable	Coefficient	Coefficient	Coefficient
CONSTANT	4.1162[2]	5.6382[2]	6.6763[2]
	(1.5864)	(0.7135)	(0.3395)
PRIORS	−0.6476[2]	−0.6579[2]	−0.7138[2]
	(0.2344)	(0.2022)	(0.1926)
NORULE	−0.0665[3]	−0.0548[3]	−0.0770[2]
	(0.0378)	(0.0314)	(0.0265)
CONDREL	0.3562	0.6963[2]	
	(0.3717)	(0.3192)	
PAROLED	-0.0943	0.0379	
	(0.3462)	0.2944	
AVEUNEMP	0.0592	0.0636	0.0691[3]
	(0.0450)	(0.0397)	(0.0395)
OFFTYPE	0.1030	0.2724	
	(0.2842)	(0.2450)	
EDUC	0.0752	0.0743	
	(0.0755)	(0.2336)	
TIMESVD	-0.0022	-0.0058	
	(0.0400)	(0.8578)	
URBAN	-0.0996		
	(0.2232)		
GROUP	0.2007		
	(0.2018)		
DRUNK	-0.0932		
	(0.2463)		
RACE	0.0530		
	(0.2401)		
AVECR	-0.0342		
	(0.1382)		
DRUGS	-0.0647		
	(0.2378)		
CRIME	0.1177		
	(0.2319)		
MARITAL	0.2294		
	(0.4790)		
BETAIQ	0.0080		
	(0.0108)		
WORKHIST	-0.1844		
	(0.2383)		
AGEOUT	0.0507		
	(0.0503)		
VOCPGM	-0.0301		
	(0.2132)		
ln L	**-285.9870**	**-341.7627**	**-347.1671**

1. Numbers in parentheses are standard errors.
2. Significant at the $\alpha = 0.05$ level.
3. Significant at the $\alpha = 0.10$ level.

the log-rank specification--none of which was significant at the $\alpha = 0.05$ level. As can be seen, however, the log likelihood for the log-rank specification model is much smaller than for the original specification. This difference is significant at the $\alpha = 0.05$ level, implying that some of the variables dropped from the model are, perhaps, contributing jointly to the explanatory power of the model.[66]

The final set of coefficients in Table 8.8 is for a lognormal model which includes all variables whose coefficients were significant at the $\alpha = 0.20$ level in the original specification. The results are similar to those for the original specification. Specifically, the variables **PRIORS** and **NORULE** appear to be significantly related to the timing of the first arrest (at the $\alpha = 0.05$ level).; **AVEUNEMP** is significant at the $\alpha = 0.10$ level. These results again suggest no previous (to the enrollment) incarcerations and few rule violations are associated with a longer time until first arrest. The positive coefficient for **AVEUNEMP** suggests that longer survival is associated with low unemployment rates. As with the log-rank specification, the log likelihood value is much smaller than that for the original specification.[67]

Thus, we have been successful in identifying several characteristics which appear to be related to the timing of the first arrest post release. Individuals who have been incarcerated at least twice, who committed a "large" number of rule violations while incarcerated for their enrollment sentence, and who returned to a county with a "high" unemployment rate were likely to be arrested sooner following release than those for whom the enrollment sentence was the first incarceration, who committed few rule violations, and who returned to a county with a "low" unemployment rate.

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[66] The appropriate test statistic is the difference between the log likelihood values of the two models multiplied by 2; this statistic is distributed χ^2 with R degrees of freedom, where R is the number of variables "dropped" from the model (technically the number of coefficients restricted to a value of 0). Thus, the test statistic is 149.7842, which is distributed χ^2_{12} ; the critical value of a $\chi^2_{12,0.05}$ test is 21.026.

[67] The test statistic is 122.3602, which is larger than the $\chi^2_{17,0.05}$ critical value of 27.587.

8.4.3 Summary of Arrest Data Analyses

The results of the survival analyses of the time to first arrest data suggest that the best indicators of a return to crime (for our subjects, or, more generally, incarcerated 18-to-22-year-old property offenders in NC) are the number of previous incarcerations and conduct while in prison. An offender whose enrollment sentence was his first and who "behaved himself" while incarcerated was more likely to have "survived" for a longer period prior to arrest after release. For the inter-facility comparison groups (section 8.4.1), conditional release (as opposed to parole or unconditional discharge) was significantly related to the time until first arrest, as was average crime rate of the county of release. Conditional release had a positive effect on the time of first arrest and low county crime rates were also associated with a lengthier time until arrest. These two variables were not significant in the intra-facility lognormal model.

Group membership (i.e., experimental, internal control, or external comparison) was not a predictor of the timing of the first arrest. The conclusion that the VDS was ineffective, however, may not be warranted for the following two reasons. First, as was noted in Chapter 5, the CE group members were "worse" than the PH group on a variety of criminality measures. The failure to find differences associated with group membership in the timing of post-release arrest can, therefore, be interpreted positively--although the CE's were no better than the PH's, they were no worse. Secondly, the survival of the experimental group was better than that of the control group, although the difference was not large enough to be significant. Chapter 6 concluded that the VDS was "successfully" implemented, but less than half of the experimental group successfully completed vocational training while some members of the control group successfully completed a vocational program. The small difference in treatment of these two groups, combined with the small number who successfully completed programs, may have resulted in the power of our tests being less than adequate.

Finally, the theoretical model suggested that reduced recidivism would directly follow from better post-release employment. As we showed in Chapter 7, this "second link" between the VDS and reduced recidivism did not occur.

8.5 *Survival Analysis of Re-incarceration Data*

In this section, we examine our second measure of post-release criminality--re-incarceration--by conducting survival analyses of the timing until return to prison (**ITIME**). As we did in section 8.4, we will first examine the timing of return to prison for the inter-facility comparison groups (section 8.5.1) and then for the intra-facility comparison groups (section 8.5.2). **ITIME** is equal to either the number of days until re-incarceration following release from prison or, for individuals not re-incarcerated between the time they were released and May 20, 1987, the length of the follow-up period. Re-incarceration includes return to prison for parole violations as well as imprisonment for a new offense.

The first step was to estimate the non-parametric Kaplan-Meier estimates of the survival distribution functions. The log-rank test statistics revealed no difference in the survival functions of (a) the CE and PH groups, and (b) the E and C groups. Subsequently, non-parametric log-rank tests were used to determine the association between survival time and individual characteristics (covariates). The variables with log-rank test statistics significant at the $\alpha = 0.20$ level were identified as candidates for inclusion in the the parametric models. The final analyses involved estimating exponential, Weibull, lognormal and log-logistic survival models for our two (inter- and intra-facility) comparison groups.

8.5.1 Inter-facility Comparisons of Time until Re-incarceration

This section analyzes the **ITIME** data available for the Phase I cohort--the experimental and internal control group members enrolled on or before November 4, 1984, (the CE group) and the external comparison group (the PH group). Forty-six (of 196) released CE's and 77 (of 145) released PH's had returned to prison in NC when the data were collected in May 1987. Section 8.5.1.1 presents the results of the non-parametric analyses. Section 8.5.1.2 presents the results for the parametric models.

8.5.1.1 Non-parametric models

Kaplan-Meier life table estimates of the survival distribution function were calculated using the Kaplan-Meier method; the results are shown in Figure 11. The life table estimates are included in the Appendix. As can be seen, the survival rate is approximately 1.0 for the first 180 days, and then declines approximately linearly until the 600th day for both groups. The survival rate at the 600th day is 74 percent (standard error of 4 percent) for the CE group and 70 percent (standard error of 3 percent) for the PH group. These estimates can be interpreted as follows: 600 days after release, 74 percent of the CE group and 70 percent of the PH group have not been re-incarcerated. The log-rank test statistic, which measures the equality of the CE and PH survival time distributions, was 1.5430. This statistic was not significant at the $\alpha = 0.05$ level. (Critical values for $\chi^2_{1,0.05}$ and $\chi^2_{1,0.10}$ are 3.841 and 2.706, respectively.) Thus, we conclude that the survival distribution functions for these two groups are the same or, equivalently, that the timing of re-incarceration is not significantly different for the two groups. **GROUP1** (that is VDS program participation) does not appear to be related to the timing of re-incarceration.

Next, we tested each of the explanatory variables listed in section 8.1 for association with survival time. The results are given in Table 8.9.

The log-rank statistics were significant at the $\alpha = 0.05$ level for 3 of these 20 variables. All were measures of criminality. The test statistics which were significant at the $\alpha = 0.05$ level imply that survival time is longer for those:

1. With no previous incarcerations (i.e., **PRIORS** = 0);
2. With 0 (or few) rule violations (i.e., small values for **NORULE**); and
3. Who were conditionally released (**CONDREL** = 1).

Additionally, **DRUNK** was significant at the $\alpha = 0.10$ level and **CRIME** and **GROUP1** were significant at the $\alpha = 0.20$ level. These six variables will comprise our **log-rank specification** for the parametric models discussed in the next section.

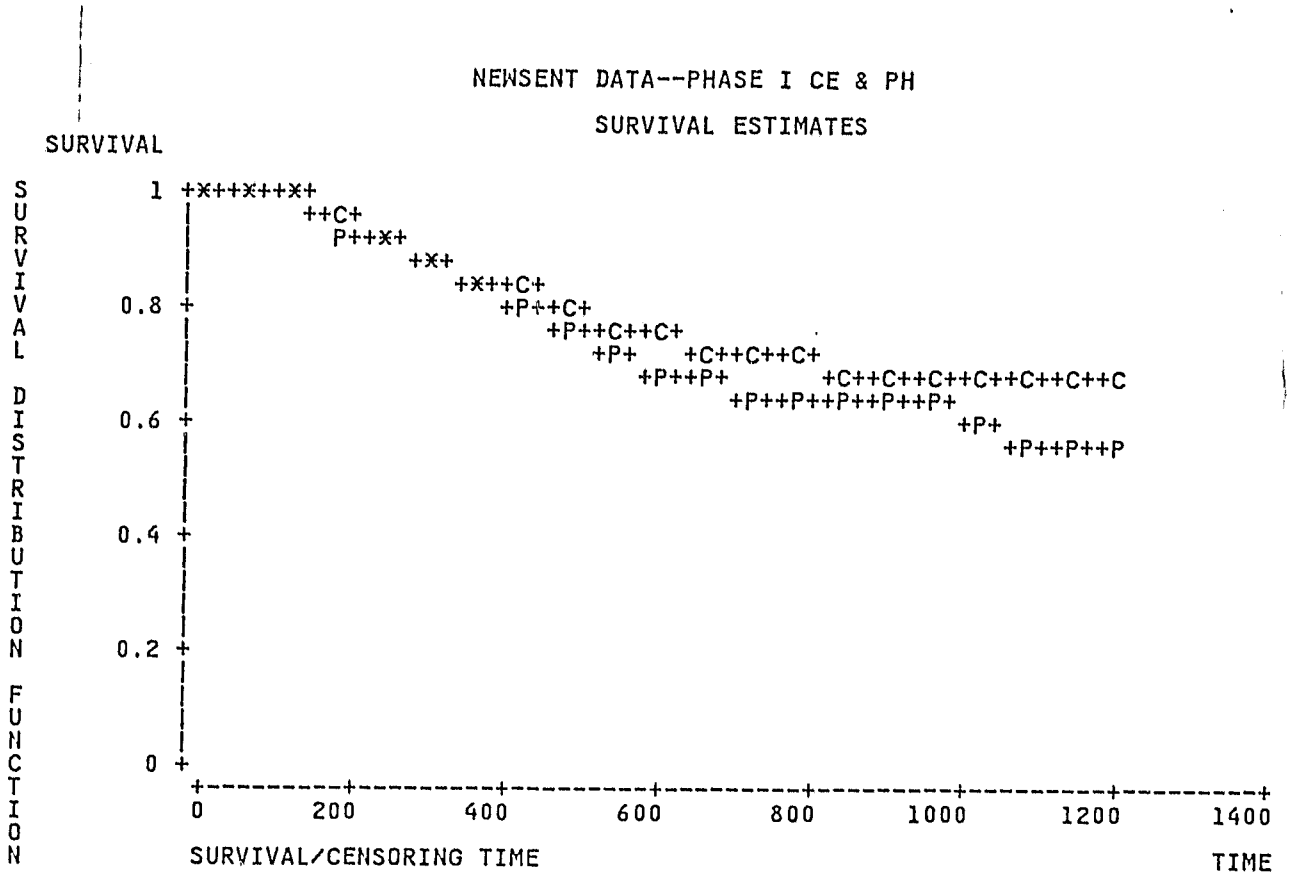

Figure 11. Survival distribution functions for the intra-facility comparison groups: The figure shows the Kaplan-Meier life table survivor function estimates for time until re-incarceration for the experimental/internal control (C) and the external comparison (P) groups.

Four of the six variables were significant at the $\alpha = 0.20$ level in the log-rank tests for association with time until first arrest (see Table 8.5). Specifically, **PRIORS, CONDREL,** and **NORULE** were significant at the $\alpha = 0.05$ level for both, while **OFFTYPE** was significant at the $\alpha = 0.05$ level for time until first arrest and at the $\alpha = 0.20$ level for time until first re-incarceration. For both models, previous convictions, a large number of rule violations and incarceration as an RYO (enrollment sentence) reduced the survival time. Conditional release (enrollment sentence) was associated with a longer survival time.

In the next section, we estimate parametric models for time until first re-incarceration.

Table 8.9. Non-parametric Tests of Explanatory Variables for ITIME Phase I (CE and PH) Releasees

Variable	Test Statistic	χ^2	$P - value^1$
PRIORS	13.5552	8.9263	0.0028
CONDREL	-10.8243	5.4888	0.0191
NORULE	66.4622	3.8720	0.0491
DRUNK	8.1084	2.9373	0.0866
CRIME	6.7713	2.2394	0.1345
GROUP1	-6.3338	1.6543	0.1984
PAROLED	5.4668	1.2081	0.2717
DRUGS	-5.1288	1.0975	0.2948
AVECR	7.9380	0.8678	0.3516
AVEUNEMP	-20.5137	0.7931	0.3732
WORKHIST	3.1470	0.4544	0.5003
EDUC	8.8303	0.3697	0.5432
MARITAL	2.0953	0.3471	0.5558
VOCPGM	-2.5027	0.3114	0.5768
URBAN	-2.3437	0.2395	0.6246
OFFTYPE	2.2415	0.2033	0.6520
TIMESVD	-11.9957	0.1701	0.6800
BETAIQ	28.8555	0.0720	0.7884
AGEOUT	4.3826	0.0675	0.7590
RACE	1.0053	0.0409	0.8398

1. Significance level at which the test statistic would be significant

8.5.1.2 Parametric models

The non-parametric tests discussed in the previous section allowed us to examine the influence of various factors on the time until first re-incarceration for the Phase I subjects without making any assumptions about the distribution of survival time. In this section, we develop parametric models of time until re-incarceration. As in section 8.4, the "candidates" for the distribution are the exponential (eq. 8.5), the Weibull (eq. 8.8), the lognormal (eq. 8.11), and the log-logistic (eq. 8.14) distributions, where we assume that the parameter(s) of the distribution are functions of explanatory variables. The estimated hazard function for the Phase I inter-facility comparison groups is shown in Figure 12. As can be seen, the hazard rate increases and then decreases with respect to time. This distribution would suggest that the lognormal (or, perhaps, the log-logistic) distribution would be the most appropriate of our four candidates for modeling the distribution of time until re-incarceration.

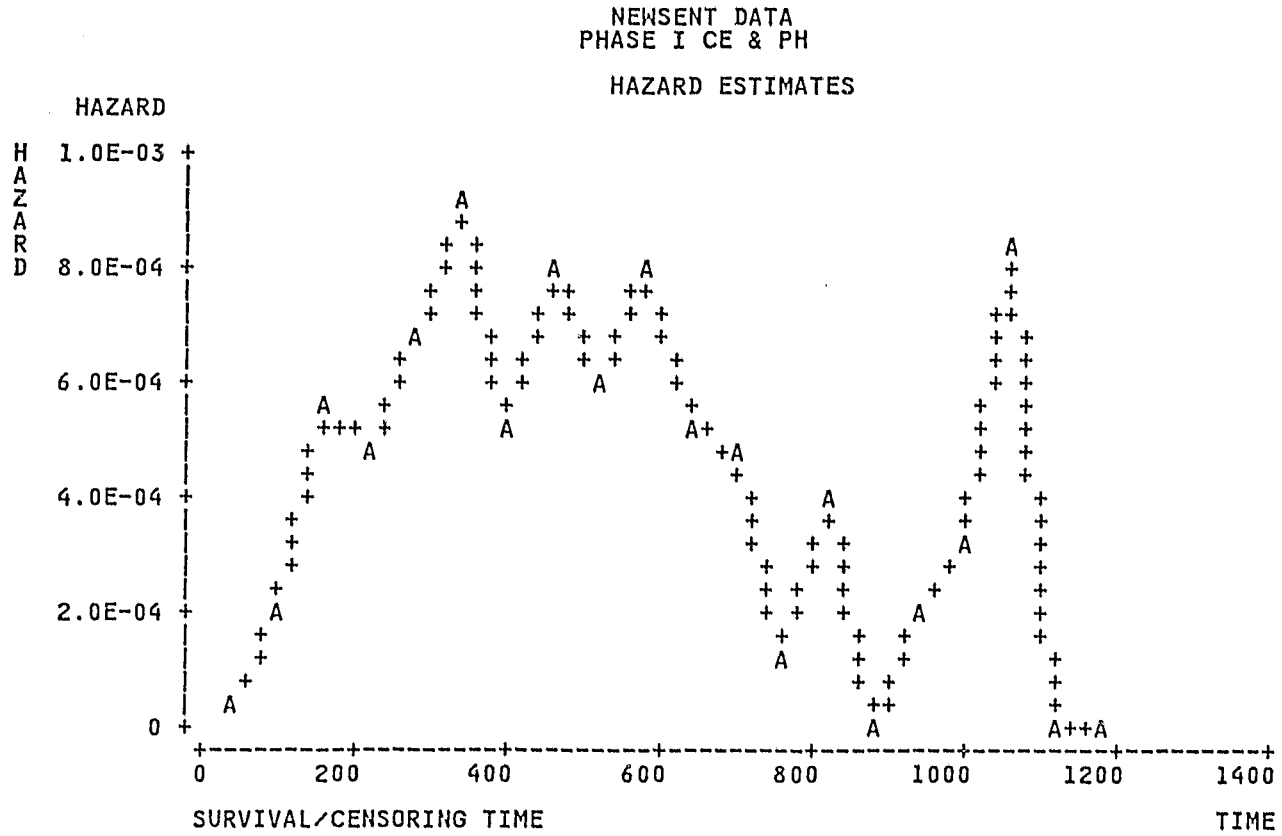

Figure 12. Estimated hazard rates for time until re-incarceration: The figure shows the Kaplan-Meier hazard estimates for the released members of the inter-facility comparison groups. Time is measured in days.

We estimated the full model (the variables listed in Table 8.9 and described in section 8.1) using each of the four distributions. The log of the likelihood function was larger for the lognormal distribution, again suggesting that this distribution is more appropriate.[68] Results

[68] The log of the likelihood function was -255.0846 for the lognormal model, -259.3033 for the Weibull model, -256.3537 for the log-logistic model, and -264.3650 for the exponential model.

of the estimation of the lognormal model are given in Table 8.10. As can be seen, only three coefficients (and the constant) are significant at the $\alpha = 0.05$ level. These are **PRIORS**, **DRUNK**, and **DRUGS**. The results suggest that the time until re-incarceration is longer for those with no previous incarcerations (**PRIORS** = 0). Those who use alcohol frequently (**DRUNK** = 1) have a shorter survival time than occasional or non-users. The coefficient for the variable **DRUGS** is positive, suggesting that frequent users of drugs have a *longer* survival time. This somewhat counter-intuitive result may be due to collinearity between the variables **DRUNK** and **DRUGS**. Two coefficients were significant at the $\alpha = 0.10$; these were the coefficients on the variables **CONDREL** and **NORULE**. As we found in the time-to-arrest analyses, the signs of these coefficients suggest that survival (time to re-incarceration) is longer for those who were conditionally released from the enrollment sentence and who had few rule violations while incarcerated for that sentence.

Also included in Table 8.10 are the coefficients estimated using the log-rank specification (the six variables significant at the $\alpha = 0.20$ level using the log-rank test). The results are essentially consistent with those from the fully specified lognormal model. Specifically, the coefficients on the variables **PRIORS** and **CONDREL** are significant in both models. In the log-rank specification, the coefficient for the indicator of group membership (**GROUP1**) is significant at the $\alpha = 0.05$ level. The positive sign for this coefficient indicates that survival is longer for members of the CE group (i.e., those individuals who received at least some of the VDS program). The log-rank specification model includes only 6 independent variables (plus the constant term) compared with 20 independent variables (plus constant) in the original specification. Thus, we have "dropped" 14 independent variables in the log-rank specification--none of which was significant at the $\alpha = 0.05$ level. As can be seen, however, the log likelihood for the log-rank specification model is much smaller than for the original specification. This difference is significant at the $\alpha = 0.05$ level, implying that collinearity exists between the variables included in the original model.[69]

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[69] The appropriate test statistic is the difference between the log likelihood values of the two models multiplied by 2; this statistic is distributed χ^2 with R degrees of freedom, where R is the number of variables "dropped" from the model (technically the number of coefficients restricted to a value of 0). Thus, the test statistic is 35.1546, which is distributed χ^2_{14}; the critical value of a $\chi^2_{14,0.05}$ test is 23.685.

Table 8.10. Lognormal Model of Time Until Re-incarceration
Phase I (CE and PH) Releasees

Variable	Model *Specification*[1]		
	Original	Log Rank	Reduced
	Coefficient	Coefficient	Coefficient
CONSTANT	7.2318[2]	7.4034[2]	7.6861[2]
	(1.7576)	(0.2131)	(0.5520)
PRIORS	−0.4802[2]	−0.4143[2]	−0.3844[2]
	(0.1875)	(0.1664)	(0.1681)
CONDREL	0.5274[3]	0.1930[2]	0.5485[2]
	(0.2699)	(0.1939)	(0.2226)
NORULE	−0.0403[3]	-0.0259	−0.0304[3]
	(0.0232)	(0.0186)	(0.0187)
DRUNK	−0.4497[2]	-0.2480	−0.4340[2]
	(0.2094)	(0.1590)	(0.1896)
CRIME	-0.1943	-0.2503	
	(0.1957)	(0.1792)	
GROUP1	0.1979	0.3314[2]	
	(0.2193)	(0.1633)	
PAROLED	-0.1882		
	(0.2460)		
DRUGS	0.4031[2]		0.3301[3]
	(0.2042)		(0.1899)
AVECR	-0.0879		
	(0.1044)		
AVEUNEMP	0.0308		
	(0.0364)		
WORKHIST	0.0013		
	(0.1940)		
EDUC	-0.0820		-0.0546
	(0.0630)		(0.0537)
MARITAL	-0.0819		
	(0.2419)		
VOCPGM	0.1380		
	(0.2166)		
URBAN	0.0378		
	(0.1889)		
OFFTYPE	0.2954		0.2216
	(0.2261)		(0.1856)
TIMESVD	0.0306		
	(0.0390)		
BETAIQ	0.0059		
	(0.0081)		
AGEOUT	0.0052		
	(0.0713)		
RACE	-0.1553		
	(0.2000)		
ln L	**-255.0846**	**-272.6619**	**-271.0321**

1. Numbers in parentheses are standard errors.
2. Significant at the $\alpha = 0.05$ level.
3. Significant at the $\alpha = 0.10$ level.

The final set of coefficients in Table 8.10 is for a lognormal model which includes all variables whose coefficients were significant at the $\alpha = 0.20$ level in the original lognormal specification. The results are the same as for the original specification. Specifically, the variables **PRIORS, CONDREL, NORULE, DRUNK,** and **DRUGS** appear to be significantly related to the timing of re-incarceration. The log likelihood value of this reduced specification is significantly different from that for the original specification, implying that we have "dropped" variables which may be jointly contributing to the explanatory power of the model.[70]

Thus, we have been successful in identifying several characteristics which appear to be related to the timing of re-incarceration post release. Individuals who have been incarcerated at least twice, who committed a "large" number of rule violations while incarcerated for their enrollment sentence, and who were paroled or unconditionally discharged were likely to be re-incarcerated sooner following release than those for whom the enrollment sentence was the first incarceration, who committed few rule violations, and who were conditionally released (from the enrollment sentence). Additionally, drug and alcohol use appears to have an effect on time until re-incarceration. Finally, in the log-rank specification of the lognormal model, the variable **GROUP1** had a significant positive effect on survival time (implying CE group members were free longer before they returned to prison); the effect was not significant in either of the other two lognormal models.

In the next section, we apply the same methodological techniques to the intra-facility comparison groups.

8.5.2 Intra-facility Comparisons of the Time until Re-incarceration

This section analyzes the time until re-incarceration for the experimental (E) and internal control (C) group members. Thirty (of 202) of the experimental group and 36 (0f 182) of the control group had returned to prison prior to May 1987. Section 8.5.2.1 presents the results

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[70] The test statistic is 31.8950, which is greater than the $\chi^2_{13,0.05}$ critical value of 22.363.

of the non-parametric analyses. Section 8.5.2.2 presents the results for the parametric models.

8.5.2.1 Non-parametric models

The survival distribution functions estimated using the Kaplan-Meier method are shown in Figure 13 (the life table estimates are included in the Appendix). As can be seen, the survival rate for the experimental group is consistently better than that of the control group. The survival rate at the 600th day is 81 percent (standard error of 3 percent) for the E group and 74 percent (standard error of 4 percent) for the C group. Thus, 600 days after release 81 percent of the experimental group and 74 percent of the control group have not returned to prison. The difference in the timing of re-incarceration for the two groups is not significant, however; the log-rank test statistic was 1.4597.[71] Thus, we conclude that the survival distribution functions for these two groups are the same or, equivalently, that the time until re-incarceration is the same for the two groups. **GROUP** (that is VDS program participation) does not appear to be related to the timing of post-release re-incarceration.

Next we tested each of the explanatory variables listed in section 8.1 for association with survival time. The results are given in Table 8.11.

The log-rank statistics were significant at the $\alpha = 0.05$ level for 6 of these 20 variables. With the exception of **DRUNK**, the significant variables were all measures of criminality. The test statistics which were significant at the $\alpha = 0.05$ level imply that the time to re-incarceration is longer for those:

1. With no previous incarcerations (i.e., **PRIORS** = 0);
2. With 0 (or few) rule violations (i.e., small values for **NORULE**);
3. Who were conditionally released (**CONDREL** = 1);
4. Who were **not** paroled (**PAROLED** = 0).
5. Who had served a (relatively) short sentence (**TIMESVD** is "small"); and

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[71] This statistic measures the equality of the the E and C survival time distributions and is distributed χ^2_1. Critical values for $\chi^2_{1,0.05}$ and $\chi^2_{1,0.10}$ are 3.841 and 2.706, respectively.

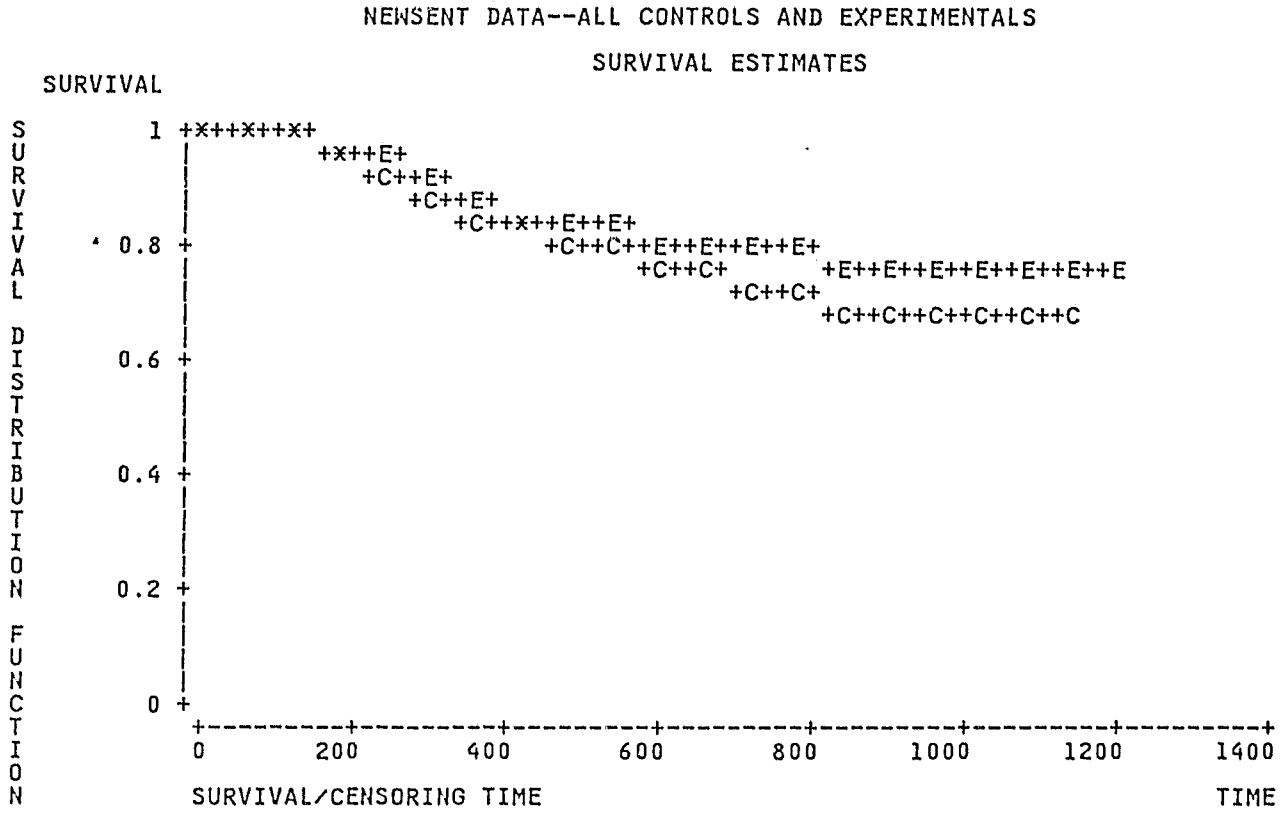

Figure 13. Survival distribution functions for the inter-facility comparison groups: The figure shows the Kaplan-Meier life table survivor function estimates for the experimental (E) and internal control (C) groups for the time until re-incarceration.

6. Who do not use alcohol frequently (**DRUNK** = 0).

Additionally, **GROUP** was significant at the $\alpha = 0.10$ level, implying longer time to re-incarceration for members of the experimental group. Finally, the variables **AVEUNEMP** and **EDUC** were significant at the $\alpha = 0.20$ level. The variables **PRIORS, NORULE, CONDREL, PAROLED, TIMESVD, DRUNK, GROUP, EDUC,** and **AVEUNEMP** will comprise the "log-rank specification" for the independent variables for the parametric models discussed in the next section.

Table 8.11. Non-parametric Tests of Explanatory Variables for ARATE Experimental and Internal Control Releasees

Variable	Test Statistic	χ^2	$P - value^1$
PRIORS	14.0841	17.4037	0.0001
NORULE	81.9343	14.5711	0.0001
CONDREL	-12.4325	13.3615	0.0003
PAROLED	8.0908	5.0718	0.0243
TIMESVD	46.8126	4.9542	0.0260
DRUNK	7.1166	4.0024	0.0454
GROUP	-5.9775	12.9018	0.0961
EDUC	-16.7979	2.4318	0.1189
AVEUNEMP	-22.3536	1.6437	0.1998
MARITAL	-2.2287	1.6409	0.2002
OFFTYPE	4.3172	1.4390	0.2303
DRUGS	4.2401	1.4331	0.2331
BETAIQ	79.4565	1.2546	0.2627
VOCPGM	-3.6731	1.1478	0.2840
WORKHIST	3.2328	0.9721	0.3242
RACE	-3.2122	0.8062	0.3692
CRIME	2.5536	0.6230	0.4299
AGEOUT	12.0679	0.4681	0.4938
AVECR	3.1289	0.3056	0.5804
URBAN	1.4333	0.1728	0.6776

1.Significance level at which the test statistic would be significant

8.5.2.2 *Parametric models*

In this section, we develop parametric models of time until re-incarceration. The "candidates" for the distribution are the same as were considered previously; as before, the lognormal (eq. 8.11) is the most appropriate.

The estimated hazard function for the intra-facility comparison groups is shown in Figure 14.[72] As can be seen, the hazard rate increases and then decreases with respect to time. This distribution would suggest that the lognormal (or, perhaps, the log-logistic) distribution would be the most appropriate of our four candidates for modeling the distribution of time until first arrest.

[72] The hazard function was estimated by the Kaplan-Meier method.

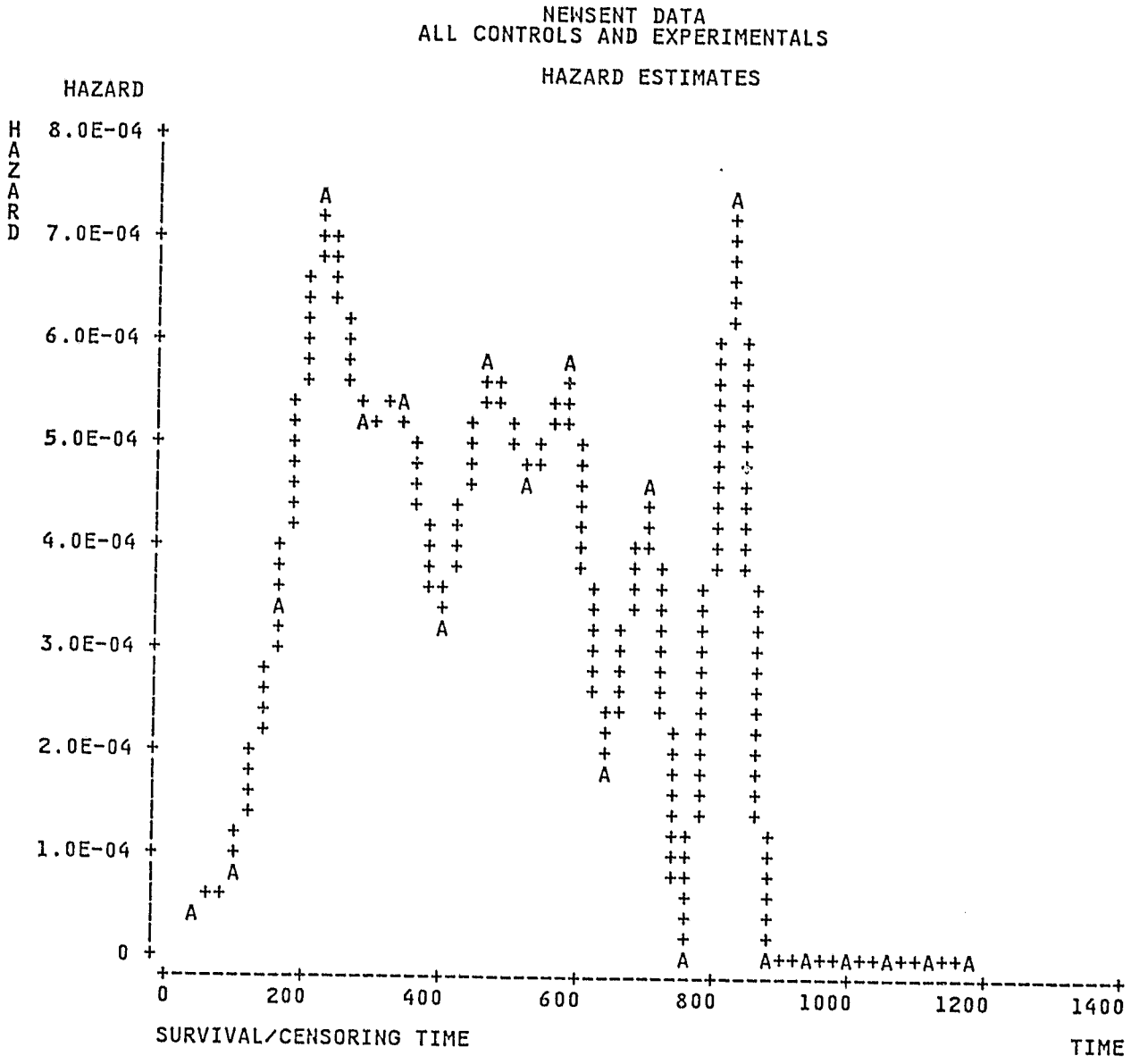

Figure 14. Estimated hazard rates for time until re-incarceration: The figure shows the Kaplan-Meier hazard estimates for the released members of the intra-facility comparison groups. Time is measured in days.

We estimated the full model (the variables listed in Table 8.11 and described in section 8.1) using each of the four distributions. The log of the likelihood function was larger for the lognormal distribution, again suggesting that this distribution is more appropriate.[73] Results

[73] The log of the likelihood function was -141.5678 for the lognormal model, -144.4453 for the Weibull model, -142.6472 for the log-logistic model, and -150.8170 for the exponential model.

of the estimation of the lognormal model are given in Table 8.12. As can be seen, only **PRIORS**, **CONDREL**, and the constant have coefficients which are significant at the $\alpha = 0.05$ level. This result suggests that the time until first re-incarceration is longer for those with no previous incarcerations (**PRIORS** = 0) who were conditionally released--a finding consistent with all our analyses. Additionally, the coefficients for **NORULE, DRUNK, EDUC, MARITAL, OFFTYPE, BETAIQ**, and **RACE** were significant at the $\alpha = 0.20$ level, suggesting that the time until re-incarceration was longer for those with few rule violations (**NORULE** "small"), who do not frequently use alcohol (**DRUNK** = 0), who have completed more schooling (**EDUC** "large"), who were married (**MARITAL** = 1), who were committed youthful offenders (**OFFTYPE** = 1), who have lower IQ's (**BETAIQ** is lower), and who are white (**RACE** = 1).

Also included in Table 8.12 are the coefficients estimated using the log-rank specification (the nine variables significant at the $\alpha = 0.20$ level using the log-rank test). The results are essentially consistent with those from the fully specified lognormal model. The likelihood ratio test statistic for the joint significance of the 11 deleted variables is significant at the $\alpha = 0.05$ level, indicating that some of the variables which are not significant at the $\alpha = 0.05$ level are jointly significant. The likelihood ratio test statistic was 19.9466.[74]

The final set of coefficients in Table 8.12 is for a lognormal model which includes all variables whose coefficients were significant at the $\alpha = 0.20$ level in the original specification. The results are the same as for the original specification. Specifically, the variables **PRIORS**, and **CONDREL** appear to be significantly related to the time until re-incarceration. Additionally, the log likelihood value is not significantly different than that for the original specification (although we have "dropped" 11 independent variables).[75]

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[74] The likelihood ratio test statistic is the difference between the log likelihood values of the two models multiplied by 2; this statistic is distributed χ^2 with R degrees of freedom, where R is the number of variables "dropped" from the model (technically the number of coefficients restricted to a value of 0). Thus, the test statistic is 19.9466, which is distributed χ^2_{11} ; the critical value of a $\chi^2_{11,0.05}$ test is 19.675.

[75] The test statistic is 10.5706, which is less than the $\chi^2_{11,0.05}$ critical value of 19.675.

Table 8.12. Lognormal Model of Time Until Re-incarceration
Released Experimentals and Internal Controls

Variable	Model *Specification*[1]		
	Original	Log-Rank	Reduced
	Coefficient	Coefficient	Coefficient
CONSTANT	7.6540[2]	6.8737[2]	7.6745[2]
	(1.7754)	(0.8020)	(1.0142)
PRIORS	−0.5308[2]	−0.4736[2]	−0.5314[2]
	(0.2097)	(0.1935)	(0.1972)
NORULE	-0.0394	-0.0419	-0.0359
	(0.0303)	(0.0288)	(0.0256)
CONDREL	0.7559[2]	0.7336[2]	1.0353[2]
	(0.3666)	(0.3602)	(0.2954)
PAROLED	-0.2851	-0.0645	
	(0.2851)	(0.2583)	
TIMESVD	-0.0094	-0.0160	
	(0.0388)	(0.0349)	
DRUNK	-0.3053	-0.3026	-0.3090
	(0.2344)	(0.1975)	(0.1958)
GROUP	0.1983	0.1694	
	(0.1973)	(0.1884)	
EDUC	0.0963	0.0568	0.1050
	(0.0721)	(0.0643)	(0.0684)
AVEUNEMP	0.0219	0.0289	
	(0.0416)	(0.0399)	
MARITAL	0.7580		0.7732
	(0.5715)		(0.5393)
OFFTYPE	0.3357		0.2981
	(0.2519)		(0.2102)
DRUGS	-0.0791		
	(0.2252)		
BETAIQ	-0.0147		0.0150
	(0.0105)		(0.0101)
VOCPGM	0.1519		
	(0.1981)		
WORKHIST	-0.0447		
	(0.2359)		
RACE	0.3139		0.2915
	(0.2267)		(0.2102)
CRIME	-0.1597		
	(0.2282)		
AGEOUT	0.0020		
	(0.0655)		
AVECR	0.0812		
	(0.1352)		
URBAN	-0.0526		
	(0.2128)		
ln L	**-141.5678**	**-151.5411**	**-146.8531**

1. Numbers in parentheses are standard errors.
2. Significant at the $\alpha = 0.05$ level.
3. Significant at the $\alpha = 0.10$ level.

Thus, we have been successful in identifying several characteristics which appear to be related to the timing of re-incarceration post release. Individuals who have been incarcerated at least twice and who were paroled or unconditionally discharged were likely return to prison sooner following release than those for whom the enrollment sentence was the first incarceration and who were conditionally discharged.

8.5.3 Summary of Re-incarceration Data Analyses

This section presented the results of the survival analyses of the timing of re-incarceration. Non-parametric and parametric models were developed. The parametric model which provided the best fit to our data was the lognormal model, which implies that the hazard rate increases and then decreases with respect to time.

The results of the survival analyses of the time until first re-incarceration, our second measure of recidivism, suggest that the best indicators of a return to crime are the number of previous incarcerations, conduct while in prison, and type of release. Specifically, the time until re-incarceration was longer for individuals who had no incarcerations prior to their enrollment incarceration (that is, had been in prison only once), who had "few" rule violations, and who were conditionally released (as opposed to paroled or unconditionally discharged).

Group membership (i.e. experimental, internal control, or external comparison) was not a predictor of the timing of re-incarceration-- although for the intra-facility comparisons using the non-parametric tests of explanatory variables, the coefficient of **GROUP** was significant at the $\alpha = 0.10$ level. (This variable was not significant at the $\alpha = 0.10$ level in the parametric models, although it was significant at the $\alpha = 0.20$ level.) This result suggested that the experimental group members were free for a longer period than the control group members.

Participation in vocational programs, which was not related to the timing of rearrest, was also not related to the timing of re-incarceration. As we noted in the text, this finding may be due to the "weakness" of the variable **VOCPGM** as a proxy for vocational skills. Specifically, this

variable signifies attempted programs and is, therefore, only weakly related to successful program completion.

8.6 *Summary of Recidivism Analyses*

In this Chapter, we presented results which addressed the third link in our theoretical model, which suggests that improvements in job skills would lead to a reduction in recidivism. As indicated in the introduction to this Chapter, as we were unable to establish a link between vocational training and better post-release employment, we expected to find no differences in the recidivism of our study groups. Results in this Chapter confirmed this *a priori* hypothesis in that we were unable to find any differences (at the $\alpha = 0.05$ level of significance) in post-release recidivism (i.e., incidence or frequency of arrest, timing of first arrest, or timing of re-incarceration) for members of the study groups. These findings, however, are subject to the following qualifications:

1. For the inter-facility comparisons, we were comparing two groups (the CE and PH groups) who differed on measures of criminality at enrollment into the study. Members of the experimental/internal control (CE) group were more serious offenders on a variety of measures of criminality than were members of the external comparison (PH) group. As the CE group was no "worse" than the PH group with respect to post-release recidivism, the VDS program (or the "CMYC/SYC experience") may, in fact, have been effective.
2. For the intra-facility comparisons, we were comparing two groups (the C and E groups) for whom the difference in in-prison treatment was small. The effect of this difference may not have been large enough to have generated a significant difference in the two groups post release.

Additionally, the survival function estimates suggest that the VDS participants had better survival rates than the non-participants for both arrest and re-incarceration, although these results were not significant at the $\alpha = 0.05$. level. This finding, although not statistically significant, is encouraging evidence that the VDS program may be having the desired effect.

The analyses presented in this Chapter provide insight into the characteristics which may be used to predict recidivism. In general, an inmate was more likely to recidivate or to have a shorter time until arrest or re-incarceration if he had two or more previous incarcerations and a number of rule violations while serving his enrollment sentence. Individuals who were

conditionally released had better survival rates than those paroled or unconditionally discharged.

The use of drugs or alcohol was significantly related to re-incarceration, but not to arrest. This result is not necessarily surprising, as it may suggest that judges are more likely to sentence arrested drug or alcohol users than those who are not substance abusers. These results were consistent with the results of the survival analyses of time until first arrest; these results (section 8.5.1) suggested that the number of previous incarcerations and rule violations were inversely related to the number of days until first arrest post release.

9.0 Final Summary and Conclusions

Presented in this final report are the findings of a four-and-one-half-year study of the implementation and evaluation of the Sandhills Vocational Delivery System (VDS)--an integrated vocational rehabilitation program for 18-to-22-year-old male offenders. Briefly, we have reported on the following:

1. The randomization procedures identified in the experimental design for selecting the members of the study groups were followed. The groups were comparable as follows:
   a. The experimental and internal control groups were indistinquishable on a variety of socio-demographic, pre-incarceration employment, and criminality measures.
   b. The external comparison group was indistinquishable from the experimental/internal control group on socio-demographic and pre-incarceration employment variables; however, these two comparison groups differed with respect to criminal history. The experimental/internal control group was composed of more serious offenders than was the external comparison group.
2. Examination of treatment integrity suggested that that the program was not completely implemented, although in most cases the experimental group members received more services than did the internal control or external comparison group members.
3. Members of the experimental group were more likely to successfully complete vocational and academic programs than were members of the internal control or external comparison groups, suggesting that the first link in the causal chain between the VDS program and reduced recidivism was realized.
4. Results of analyses of post-release employment characteristics revealed no differences between the experimental and internal control groups or the experimental/internal control and external comparison groups. Thus, the second theoretical link--that vocational training would lead to better post-release employment--was not realized.
5. Examination of the incidence, frequency and timing of first arrest post-release also revealed that the groups did not differ significantly with respect to any of these measures. As members of the experimental and internal control groups were more serious offenders at the time of enrollment in the study than members of the external comparison group, the finding that none of the groups was "worse" post-release could signify weak evidence of the efficacy of the VDS program.
6. No significant differences were found between the groups with respect to the incidence or timing of re-incarceration following release. Although, again, as the experimental and control group members were no worse than the external control group members with respect to these measures of recidivism, we could interpret the lack of difference as a weak indicator of program success.

7. Survival analyses of the data revealed several variables which were significantly related to the timing of arrest and re-incarceration. More previous incarcerations and more rule violations while serving the enrollment sentence were associated with shorter times to arrest and re-incarceration. Conditional release was associated with longer times to arrest and re-incarceration, while frequent use of alcohol was associated with a short time to re-incarceration.

In this, the final Chapter, we summarize the theoretical model which underlies the study, the hypotheses which link the design of the evaluation with the VDS implementation, the most important aspects of the VDS program, and the findings with respect to these hypotheses. We summarize the results forthcoming from our analyses and discuss the implications of these results for the VDS program at Sandhills and for research in program implementation and evaluation. Finally, because the study was predicated on the economic model of criminal behavior, we discuss the effect of the program on post-release employment and recidivism.

9.1 Implications of the Theoretical Model

The goals of this study were to examine program implementation and the effectiveness of the Sandhills VDS. The question which must be, and was, addressed is: What criteria constitute "effectiveness" in terms of the VDS program? In terms of correctional programs, the ultimate measure of effectiveness is reduction in recidivism. Our study was premised on an economic model of criminal behavior which states that when the costs associated with engaging in illegal activities outweigh the benefits associated with engaging in legitimate activities, a rational individual will choose to engage in the illegal activity. In terms of the VDS implementation and evaluation, the following "links" derive from this underlying theoretical model:

I. Successful vocational program participation --> Improved job skills;

II. Improved job skills --> A "better" job, post-release;

III. A "better" job --> Reduced recidivism.

From these "causal" links the following testable hypotheses derive:

1. Program participants who successfully complete more vocational programs will increase their level of skill;
2. A higher level of skill will result in a "better" job upon release;
3. Employment, post-release, will reduce the likelihood of an offender recidivating.

Thus, the economic model of criminal behavior, when superimposed on the VDS evaluation, proposes that a youthful offender who has successfully completed vocational programs will have a a higher level of skill and should, therefore, obtain a higher-paying job post-release than would an offender who has not successfully completed (or has not received) vocational training. If an offender obtains a better job, then he will be less likely to recidivate, i.e., the economic incentives favor the choice of the legitimate (employment) activity. In order to test these hypotheses and to determine whether this causal chain accurately models criminal behavior, the VDS project was initiated in June 1983.

9.2 Evaluation Design

The "corner stone" of the Sandhills VDS project was the development and implementation of a true experimental design. A true experimental design is one in which subjects are randomly assigned to receive, or not to receive, treatment. In our study the treatment was the VDS program and the subjects were youthful property offenders who were selected, prior to assignment, on the basis of several objective demographic, educational, behavioral and criminality measures. In addition, because the underlying model was an economically based one, only inmates who were sentenced for "economically motivated" (that is, property) offenses were included. The experimental design was instituted to ensure that the study groups were "statistically" homogeneous. The significance of homogeneity is that if the analyses show that post-release behavior differs between treatment and non-treatment groups then the differences may more easily be attributed to treatment effects rather than to other "uncontrolled" effects. The importance of a true experimental design in the evaluation of treatment

is one which is often overlooked and more frequently, compromised, in studies of correctional program evaluation, implementation, and effectiveness.

The original experimental design incorporated a two-stage randomization procedure. Specifically, participants were selected at the Polk or Harnett youth facilities to either remain at Polk/Harnett (PH) or to be transferred to the Cameron Morrison Youth Facility (CMYC). Inmates who remained at Polk/Harnett were classified as the external control group. At CMYC, individuals who were selected for participation were assigned either to the experimental group or to an internal control group. The experimentals were to receive all components of the VDS; the internal control group members were to receive some, but not all, of the VDS on an "as available" basis. Participants assigned at CMYC were referred to as the CMYC/SYC group. The VDS was not available at Polk/Harnett and, thus, the external controls received none of these services. Random assignment of subjects to one of these three groups allowed for treatment comparisons on an **inter-facility** basis (PH versus CMYC/SYC) and an **intra-facility** basis (controls (C) versus experimentals (E) at CMYC/SYC). The original design continued to be applied until November 1984 when a decline in the number of youthful offenders entering the North Carolina youth prison command forced the design to be modified. The modified design eliminated the first stage of randomization and, thus, the external control group. Following the elimination of enrollment into the external control group, the Department of Correction agreed that no individual assigned to the Polk/Harnett group would be transferred to CMYC. Thus, follow-up data were available for the PH group and, more importantly, the integrity of the experimental design was maintained.

This modified design was still a true experimental design, but was less powerful in that treatment differences were smaller between the experimentals and the internal controls. In order to allow for maximum differentiation and power of statistical comparisons between these two groups in the analyses, the sample size was increased by extending the length of the enrollment period for the project to July 1986. The loss of the external control group (in essence the no-treatment group) seriously limited the ability to identify effects due to differences in treatment.

Results showed that the integrity of the experimental design was maintained throughout the enrollment period of the project. Specifically, as reported in Chapter 5, there were no significant differences between groups when compared on the basis of demographics, education, ability or, pre-incarceration employment activity. However, differences in pre-incarceration criminality were found to exist. Specifically, the CMYC/SYC group had more prior convictions and sentences than the PH group. In addition, CMYC/SYC members had received longer sentences, on average, for their current offense and were more likely to be classified as regular youthful offenders (RYO's) than committed youthful offenders (CYO's). These results indicated that study participants (the CMYC/SYC groups) were worse on all available criminality measures than the members of the external comparison (PH) group. Thus, if differences in post-release activity by group were found, these differences could not be attributed to differences in demographics, education or ability measures but may be attributable to differences in pre-incarceration criminality.

9.3 *The VDS and Treatment Integrity*

The next phase in the analyses sought to determine whether the the VDS had been successfully implemented. Specifically, did members of the experimental group actually receive the component services of the VDS, and did the experimentals receive more of these services than the internal controls? The VDS, as described in Chapter 4, consists of several integrated elements including evaluation; correctional plan development; vocational, academic and enrichment programs; MAPP contracts; community re-entry training; and job counselling and placement. Integration, in this context, refers to the coordination of the various elements of the VDS. When integrated, the VDS is intended to determine what types of skills are needed (or is most appropriate) for an inmate, develop a correctional plan which is consistent with the needs and interests of the inmate, and assist them in fulfilling their plan through continual monitoring of their progress. Subsequently, through the VDS, the inmate is readied for re-entry into the "free" world and helped to find a job. As reported in Chapter 6, the coordination of VDS services was highly variable for members of the experimental group. That is, assignment to the experimental group did not ensure that a participant would receive all elements

of the VDS. Results showed that differences in delivery of VDS services to experimental and internal control group members were not extensive, although experimental group members were more likely to receive services than internal control group members. In terms of the study, the results suggest that if the VDS program (as an integrated system) is hypothesized to enhance vocational skills and post-release employment for "full" VDS participants then the fact that a low percentage of inmates actually received the integrated system suggests that this "link" in the causal chain was compromised.

The results presented in Chapter 6 do show, however, that members of the experimental group received **more** of the VDS services than did members of the internal control group. However, as noted, few, if any, of the experimentals received **all** of the VDS' elements. The results also suggested that the internal control group members were not denied access to vocational and academic programs (that is, these programs do not appear to have been a "scarce" resource). Thus, with respect to programs, the difference in treatment between the experimentals and internal controls was not as great as would have been desirable for purposes of the evaluation.

As noted in the previous discussion, the integrity of the evaluation design was only marginally maintained in that the experimentals failed (for the most part) to receive all elements of the VDS, although they appear to have received more programs. The next question which comes to bear on the hypotheses under consideration is: Were the experimentals more likely to successfully complete programs? This is an important issue in the study, in that successful completion of a vocational program (for example) may be used as a proxy for an improved level of skill. In addition, if the experimentals were more likely to complete a program then it suggests that the integrity of the correctional plan element of the VDS was being upheld. The results presented in Chapter 6 show that members of the experimental group were more likely to successfully complete more programs than were members of the control group. Given this result, the following conclusions were made. First, the experimentals on average showed a greater increase in skill level than did the internal controls. Secondly, the integrity of the program delivery component of the evaluation design was maintained.

The results suggest that, although there were differences in treatment between the internal controls and experimentals, the differences were small. The experimentals were more likely to successfully complete programs than were the controls. This is an important result, given that success in a vocational programs was used a a proxy for increased skill. Thus, this last finding should impact on the second link in the "causal chain." That is, if the experimentals have better skills, then they (as a group) should be more likely to find a job (post-release) and, that job should be better-paying.

9.4 Post-Release Employment Results

The analyses of post-release employment activity centered on two questions:

1. Were experminentals more likely to be employed than the internal controls?
2. Were the experimentals who found employment more likely to receive a higher wage?

A priori, one would assume that since the experimentals had "more" marketable skills, upon release, that they would be more likely to find a job and should receive a higher wage. Unfortunately, we were not able to confirm these *a priori* assumptions. Specifically, experimentals and controls were equally likely to be employed and there was no significant difference in the average quarterly wage earned, post-release. A comparison of the CMYC/SYC releasees with the external control group (PH) releasees also confirmed these findings. In addition, analyses on the demographic, pre-incarceration employment and education characteristics yielded no significant differences in released subjects' characteristics which could account for these findings. In an attempt to "explain" the apparent failure of the VDS (or more specifically, program participation) to result in improved employment, post-release, the following discussion is offered.

Results suggest that the differences in treatment between the groups at CMYC/SYC may not have been significant enough to effect differences in post-release employment activity. Results of the comparisons of VDS participants and VDS nonparticipants also showed no differences in employment activity, post-release. Given that VDS participation did not appear to signif-

icantly effect employment, post-relesae, one could argue that vocational training has no effect on post-release employment. This seems unrealistic, particularly if one recognizes that the labor market is volitile and competitive. This complexity is magnified for a 19-to-22-year-old convicted felon. Thus, it may be unrealistic to expect that a releasee should be able to obtain a job, particularly a job that pays more than minimum wage. If the follow-up were extended a difference might appear, but in the length of time used for our follow-up, demonstrating differences by group may be unrealistic. Nevertheless, it is important to recognize that subjects who successfully completed vocational programs and, as a result, have acquired new skills, have not "lost" those skills.[76]

The next section will address the issue of whether participants in the VDS program were less likely to recidivate. These analyses are "linked", in terms of the theoretical model, to post-release employment success. As discussed above, this link could not be established given our data. However, because reduction in recidivism is the ultimate goal of the VDS, the importance of these analyses cannot be understated.

9.5 *Summary of Recidivism Results*

Chapter 8 presented the results which addressed the third link in the theoretical model, namely that better jobs would lead to a reduction in recidivism. *A priori*, given that no differences were found in post-release employment, we did not expect to see differences in post-release measures of criminality. The results confirmed this expectation in that no differences between the post-release recidivism of the inter-facility comparison groups or the intra-facility comparison groups were identified. These results are subject, however, to the following qualifications:

1. For the inter-facility comparisons, we compared two groups (the CE and PH groups) who differed on measures of criminality at enrollment into the study. Members of the experimental/internal control (CE) group were more serious offenders on a variety of measures of criminality than were members of the external comparison (PH) group. As

[76] All measures of post-release employment considered in this report concerned the first job or first quarter's employment post-release.

the CE group was no "worse" than the PH group with respect to post-release recidivism, the VDS program (or the "CMYC/SYC experience") may, in fact, have been effective.

2. For the intra-facility comparisons, we compared two groups (the C and E groups) for whom the difference in prison treatment (program exposure) was small. The effect of this difference may not have been large enough to have generated a significant difference in the two groups post release.

Additionally, the survival function estimates presented in Chapter 8 suggest that the VDS participants had better survival rates for both arrest and re-incarceration although these results were not significant. This finding, although not statistically significant, is encouraging evidence that the VDS program may be having the desired effect.

Finally, the non-parametric and parametric survival models suggested that the best predictors of post-release arrest and re-incarceration were number of prior incarcerations and number of rule violations (during the enrollment sentence). Previous incarcerations and numerous rule violations were associated with shorter survival times post release. Conditional release was also significant as a predictor of survival time, in that those who were conditionally released "survived" longer than those paroled or unconditionally discharged. Frequent drug or alcohol use was associated with shorter survival on the re-incarceration survival measure, but was not significant with respect to timing until first arrest. It may be that judges are more likely to incarcerate those who are substance abusers.

9.6 Conclusions

Presented in this report are the findings of a four-and-one-half-year study of a rehabilitative program for youthful offenders. The program superimposed an economic model of criminal behavior on a integrated program for vocational rehabilitation. The study was unique in that it presumed a theoretical model of criminal behavior and used a true experimental design to test the hypotheses resulting from the model. The goal of any rehabilitative correctional program is to reduce recidivism. In this study, we were unable to conclusively "link" successful program participation with reduction in recidivism. The results, however, are encouraging. That is, we were able to show that the VDS program could effect changes in inmate behavior

(successful completion of programs) and that although these changes could not be tied directly to a reduction in recidivism, there is evidence to suggest that the effect(s) of rehabilitative programs is to improve an offenders chances of succeeding, post-release. This conclusion derives from the inter-facility post-release employment and recidivism findings which show that VDS participants, who were more serious offenders, were as likely not to recidivate as were non-VDS participants. As has been noted and emphasized by all previous studies, recidivism is a complex problem. However, as shown by the results of this study, the implementation of a carefully conceived and implemented evaluation design may be an important in-road to identifying the measures which may alleviate the societal burden of recidivism.

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Appendix

This appendix includes the Kaplan-Meier life table estimates of the survival function of time until arrest and re-incarceration for the inter- and intra-facility comparison groups. The tables are included as follows:

1. Estimates of time until first arrest, CE group;
2. Estimates of time until first arrest, PH group;
3. Estimates of time until first arrest, C group;
4. Estimates of time until first arrest, E group;
5. Estimates of time until re-incarceration, CE group;
6. Estimates of time until re-incarceration, PH group;
7. Estimates of time until re-incarceration, C group; and
8. Estimates of time until re-incarceration, E group.

COMPARING PHASE I CE & PH

LIFE TABLE SURVIVAL ESTIMATES
GROUP1=CE

INTERVAL	MIDPOINT	EVENTS	WITHDRAWALS	EFFECTIVE SIZE	CONDITIONAL PROBABILITY	PROBABLITY STD ERROR	SURVIVAL	FAILURE
0	30	6	0	163.0	0.03681	0.01475	1.0000	0.0000
60	90	9	2	156.0	0.05769	0.01867	0.9632	0.0368
120	150	9	3	144.5	0.06228	0.02010	0.9076	0.0924
180	210	12	3	132.5	0.09057	0.02493	0.8511	0.1489
240	270	8	5	116.5	0.06867	0.02343	0.7740	0.2260
300	330	2	3	104.5	0.01914	0.01340	0.7209	0.2791
360	390	8	7	97.5	0.08205	0.02779	0.7071	0.2929
420	450	4	3	84.5	0.04734	0.02310	0.6490	0.3510
480	510	5	6	76.0	0.06579	0.02844	0.6183	0.3817
540	570	6	2	67.0	0.08955	0.03488	0.5776	0.4224
600	630	1	8	56.0	0.01786	0.01770	0.5259	0.4741
660	690	1	2	50.0	0.02000	0.01980	0.5165	0.4835
720	750	1	5	45.5	0.02198	0.02174	0.5062	0.4938
780	810	0	6	39.0	0.00000	.	0.4951	0.5049
840	870	0	9	31.5	0.00000	.	0.4951	0.5049
900	930	0	6	24.0	0.00000	.	0.4951	0.5049
960	990	0	5	18.5	0.00000	.	0.4951	0.5049
1020	1050	0	7	12.5	0.00000	.	0.4951	0.5049
1080	1110	0	3	7.5	0.00000	.	0.4951	0.5049
1140	1170	0	1	5.5	0.00000	.	0.4951	0.5049
1200		1	4	3.0	0.33333	0.27217	0.4951	0.5049

		SURVIVAL STD ERROR	PDF	PDF STD ERROR	HAZARD	HAZARD STD ERROR	CONDITIONAL MEDIAN	MEDIAN STD ERROR
0	30	0.0000	6.1E-04	2.5E-04	6.2E-04	2.6E-04	753.405	211.214
60	90	0.0147	9.3E-04	3.0E-04	9.9E-04	3.3E-04	.	.
120	150	0.0227	9.4E-04	3.1E-04	.0010714	3.6E-04	.	.
180	210	0.0281	.0012847	3.6E-04	0.001581	4.6E-04	.	.
240	270	0.0332	8.9E-04	3.0E-04	.0011852	4.2E-04	.	.
300	330	0.0358	2.3E-04	1.6E-04	3.2E-04	2.3E-04	.	.
360	390	0.0365	9.7E-04	3.3E-04	0.001426	5.0E-04	.	.
420	450	0.0388	5.1E-04	2.5E-04	8.1E-04	4.0E-04	.	.
480	510	0.0399	6.8E-04	3.0E-04	.0011338	5.1E-04	.	.
540	570	0.0412	8.6E-04	3.4E-04	.0015625	6.4E-04	.	.
600	630	0.0426	1.6E-04	1.6E-04	3.0E-04	3.0E-04	.	.
660	690	0.0428	1.7E-04	1.7E-04	3.4E-04	3.4E-04	.	.
720	750	0.0432	1.9E-04	1.8E-04	3.7E-04	3.7E-04	.	.
780	810	0.0437	0	.	0	.	.	.
840	870	0.0437	0	.	0	.	.	.
900	930	0.0437	0	.	0	.	.	.
960	990	0.0437	0	.	0	.	.	.
1020	1050	0.0437	0	.	0	.	.	.
1080	1110	0.0437	0	.	0	.	.	.
1140	1170	0.0437	0	.	0	.	.	.
1200	.	0.0437	.	.	.	.	.	.

COMPARING PHASE I CE & PH

LIFE TABLE SURVIVAL ESTIMATES
GROUP1=PH

INTERVAL	MIDPOINT	EVENTS	WITHDRAWALS	EFFECTIVE SIZE	CONDITIONAL PROBABILITY	PROBABLITY STD ERROR	SURVIVAL	FAILURE
0	30	8	0	194.0	0.04124	0.01428	1.0000	0.0000
60	90	8	0	186.0	0.04301	0.01488	0.9588	0.0412
120	150	13	3	176.5	0.07365	0.01966	0.9175	0.0825
180	210	9	0	162.0	0.05556	0.01800	0.8499	0.1501
240	270	7	5	152.5	0.04590	0.01695	0.8027	0.1973
300	330	6	0	145.0	0.04138	0.01654	0.7659	0.2341
360	390	4	2	138.0	0.02899	0.01428	0.7342	0.2658
420	450	8	3	131.5	0.06084	0.02084	0.7129	0.2871
480	510	6	3	120.5	0.04979	0.01982	0.6695	0.3305
540	570	4	2	112.0	0.03571	0.01754	0.6362	0.3638
600	630	4	4	105.0	0.03810	0.01868	0.6135	0.3865
660	690	1	7	95.5	0.01047	0.01042	0.5901	0.4099
720	750	5	4	89.0	0.05618	0.02441	0.5839	0.4161
780	810	0	4	80.0	0.00000	.	0.5511	0.4489
840	870	1	11	72.5	0.01379	0.01370	0.5511	0.4489
900	930	3	10	61.0	0.04918	0.02769	0.5435	0.4565
960	990	2	10	48.0	0.04167	0.02884	0.5168	0.4832
1020	1050	1	13	34.5	0.02899	0.02856	0.4953	0.5047
1080	1110	0	5	24.5	0.00000	.	0.4809	0.5191
1140	1170	0	4	20.0	0.00000	.	0.4809	0.5191
1200	.	0	18	9.0	0.00000	.	0.4809	0.5191

		SURVIVAL STD ERROR	PDF	PDF STD ERROR	HAZARD	HAZARD STD ERROR	CONDITIONAL MEDIAN	MEDIAN STD ERROR
0	30	0.0000	6.9E-04	2.4E-04	7.0E-04	2.5E-04	1006.79	100.027
60	90	0.0143	6.9E-04	2.4E-04	7.3E-04	2.6E-04	.	.
120	150	0.0198	.0011263	3.0E-04	.0012745	3.5E-04	.	.
180	210	0.0257	7.9E-04	2.6E-04	9.5E-04	3.2E-04	.	.
240	270	0.0287	6.1E-04	2.3E-04	7.8E-04	3.0E-04	.	.
300	330	0.0306	5.3E-04	2.1E-04	7.0E-04	2.9E-04	.	.
360	390	0.0319	3.5E-04	1.8E-04	4.9E-04	2.5E-04	.	.
420	450	0.0327	7.2E-04	2.5E-04	.0010458	3.7E-04	.	.
480	510	0.0341	5.6E-04	2.2E-04	8.5E-04	3.5E-04	.	.
540	570	0.0350	3.8E-04	1.9E-04	6.1E-04	3.0E-04	.	.
600	630	0.0356	3.9E-04	1.9E-04	6.5E-04	3.2E-04	.	.
660	690	0.0361	1.0E-04	1.0E-04	1.8E-04	1.8E-04	.	.
720	750	0.0362	5.5E-04	2.4E-04	9.6E-04	4.3E-04	.	.
780	810	0.0371	0	.	0	.	.	.
840	870	0.0371	1.3E-04	1.3E-04	2.3E-04	2.3E-04	.	.
900	930	0.0373	4.5E-04	2.5E-04	8.4E-04	4.9E-04	.	.
960	990	0.0385	3.6E-04	2.5E-04	7.1E-04	5.0E-04	.	.
1020	1050	0.0398	2.4E-04	2.4E-04	4.9E-04	4.9E-04	.	.
1080	1110	0.0412	0	.	0	.	.	.
1140	1170	0.0412	0	.	0	.	.	.
1200	.	0.0412	.	.	.	.	.	.

ARRESTS DATA -- ALL CONTROLS AND EXPERIMENTALS

LIFE TABLE SURVIVAL ESTIMATES
GROUP=C

INTERVAL	MIDPOINT	EVENTS	WITHDRAWALS	EFFECTIVE SIZE	CONDITIONAL PROBABILITY	PROBABLITY STD ERROR	SURVIVAL	FAILURE
0	30	5	0	187.0	0.02674	0.01180	1.0000	0.0000
60	90	16	1	181.5	0.08815	0.02104	0.9733	0.0267
120	150	7	13	158.5	0.04416	0.01632	0.8875	0.1125
180	210	8	7	141.5	0.05654	0.01942	0.8483	0.1517
240	270	6	18	121.0	0.04959	0.01974	0.8003	0.1997
300	330	6	15	98.5	0.06091	0.02410	0.7606	0.2394
360	390	5	12	79.0	0.06329	0.02739	0.7143	0.2857
420	450	2	9	63.5	0.03150	0.02192	0.6691	0.3309
480	510	2	12	51.0	0.03922	0.02718	0.6480	0.3520
540	570	4	2	42.0	0.09524	0.04529	0.6226	0.3774
600	630	2	7	33.5	0.05970	0.04094	0.5633	0.4367
660	690	0	3	26.5	0.00000	.	0.5297	0.4703
720	750	0	4	23.0	0.00000	.	0.5297	0.4703
780	810	0	5	18.5	0.00000	.	0.5297	0.4703
840	870	0	7	12.5	0.00000	.	0.5297	0.4703
900	930	0	3	7.5	0.00000	.	0.5297	0.4703
960	990	0	2	5.0	0.00000	.	0.5297	0.4703
1020	1050	0	0	4.0	0.00000	.	0.5297	0.4703
1080	1110	0	2	3.0	0.00000	.	0.5297	0.4703
1140	1170	0	0	2.0	0.00000	.	0.5297	0.4703
1200	.	0	2	1.0	0.00000	.	0.5297	0.4703

		SURVIVAL STD ERROR	PDF	PDF STD ERROR	HAZARD	HAZARD STD ERROR	CONDITIONAL MEDIAN	MEDIAN STD ERROR
0	30	0.0000	4.5E-04	2.0E-04	4.5E-04	2.0E-04	.	.
60	90	0.0118	0.00143	3.4E-04	0.001537	3.8E-04	.	.
120	150	0.0231	6.5E-04	2.4E-04	7.5E-04	2.8E-04	.	.
180	210	0.0264	8.0E-04	2.8E-04	9.7E-04	3.4E-04	.	.
240	270	0.0299	6.6E-04	2.6E-04	8.5E-04	3.5E-04	.	.
300	330	0.0325	7.7E-04	3.1E-04	.0010471	4.3E-04	.	.
360	390	0.0356	7.5E-04	3.3E-04	.0010893	4.9E-04	.	.
420	450	0.0387	3.5E-04	2.5E-04	5.3E-04	3.8E-04	.	.
480	510	0.0402	4.2E-04	2.9E-04	6.7E-04	4.7E-04	.	.
540	570	0.0425	9.9E-04	4.7E-04	.0016667	8.3E-04	.	.
600	630	0.0477	5.6E-04	3.9E-04	.0010256	7.2E-04	.	.
660	690	0.0504	0	.	0	.	.	.
720	750	0.0504	0	.	0	.	.	.
780	810	0.0504	0	.	0	.	.	.
840	870	0.0504	0	.	0	.	.	.
900	930	0.0504	0	.	0	.	.	.
960	990	0.0504	0	.	0	.	.	.
1020	1050	0.0504	0	.	0	.	.	.
1080	1110	0.0504	0	.	0	.	.	.
1140	1170	0.0504	0	.	0	.	.	.
1200	.	0.0504	.	.	.	.	.	.

ARRESTS DATA -- ALL CONTROLS AND EXPERIMENTALS

LIFE TABLE SURVIVAL ESTIMATES
GROUP=E

INTERVAL	MIDPOINT	EVENTS	WITHDRAWALS	EFFECTIVE SIZE	CONDITIONAL PROBABILITY	PROBABLITY STD ERROR	SURVIVAL	FAILURE
0	30	9	0	208.0	0.04327	0.01411	1.0000	0.0000
60	90	8	7	195.5	0.04092	0.01417	0.9567	0.0433
120	150	11	8	180.0	0.06111	0.01785	0.9176	0.0824
180	210	11	11	159.5	0.06897	0.02006	0.8615	0.1385
240	270	7	8	139.0	0.05036	0.01855	0.8021	0.1979
300	330	3	8	124.0	0.02419	0.01380	0.7617	0.2383
360	390	4	20	107.0	0.03738	0.01834	0.7433	0.2567
420	450	2	15	85.5	0.02339	0.01635	0.7155	0.2845
480	510	3	10	71.0	0.04225	0.02387	0.6987	0.3013
540	570	3	8	59.0	0.05085	0.02860	0.6692	0.3308
600	630	0	14	45.0	0.00000	.	0.6352	0.3648
660	690	1	3	36.5	0.02740	0.02702	0.6352	0.3648
720	750	1	9	29.5	0.03390	0.03332	0.6178	0.3822
780	810	0	4	22.0	0.00000	.	0.5969	0.4031
840	870	0	2	19.0	0.00000	.	0.5969	0.4031
900	930	0	3	16.5	0.00000	.	0.5969	0.4031
960	990	0	3	13.5	0.00000	.	0.5969	0.4031
1020	1050	0	7	8.5	0.00000	.	0.5969	0.4031
1080	1110	0	1	4.5	0.00000	.	0.5969	0.4031
1140	1170	0	1	3.5	0.00000	.	0.5969	0.4031
1200	.	1	2	2.0	0.50000	0.35355	0.5969	0.4031

		SURVIVAL STD ERROR	PDF	PDF STD ERROR	HAZARD	HAZARD STD ERROR	CONDITIONAL MEDIAN	MEDIAN STD ERROR
0	30	0.0000	7.2E-04	2.4E-04	7.4E-04	2.5E-04	.	.
60	90	0.0141	6.5E-04	2.3E-04	7.0E-04	2.5E-04	.	.
120	150	0.0192	9.3E-04	2.7E-04	.0010506	3.2E-04	.	.
180	210	0.0243	9.9E-04	2.9E-04	.0011905	3.6E-04	.	.
240	270	0.0285	6.7E-04	2.5E-04	8.6E-04	3.3E-04	.	.
300	330	0.0309	3.1E-04	1.8E-04	4.1E-04	2.4E-04	.	.
360	390	0.0319	4.6E-04	2.3E-04	6.3E-04	3.2E-04	.	.
420	450	0.0336	2.8E-04	2.0E-04	3.9E-04	2.8E-04	.	.
480	510	0.0348	4.9E-04	2.8E-04	7.2E-04	4.2E-04	.	.
540	570	0.0373	5.7E-04	3.2E-04	8.7E-04	5.0E-04	.	.
600	630	0.0403	0	.	0	.	.	.
660	690	0.0403	2.9E-04	2.9E-04	4.6E-04	4.6E-04	.	.
720	750	0.0427	3.5E-04	3.4E-04	5.7E-04	5.7E-04	.	.
780	810	0.0461	0	.	0	.	.	.
840	870	0.0461	0	.	0	.	.	.
900	930	0.0461	0	.	0	.	.	.
960	990	0.0461	0	.	0	.	.	.
1020	1050	0.0461	0	.	0	.	.	.
1080	1110	0.0461	0	.	0	.	.	.
1140	1170	0.0461	0	.	0	.	.	.
1200	.	0.0461	.	.	.	.	.	.

NEWSENT DATA--PHASE I CE & PH

LIFE TABLE SURVIVAL ESTIMATES
GROUP1=CE

INTERVAL	MIDPOINT	EVENTS	WITHDRAWALS	EFFECTIVE SIZE	CONDITIONAL PROBABILITY	PROBABLITY STD ERROR	SURVIVAL	FAILURE
0	30	1	4	194.0	0.00515	0.00514	1.0000	0.0000
60	90	1	3	189.5	0.00528	0.00526	0.9948	0.0052
120	150	3	7	183.5	0.01635	0.00936	0.9896	0.0104
180	210	6	8	173.0	0.03468	0.01391	0.9734	0.0266
240	270	9	6	160.0	0.05625	0.01822	0.9397	0.0603
300	330	6	7	144.5	0.04152	0.01660	0.8868	0.1132
360	390	3	7	131.5	0.02281	0.01302	0.8500	0.1500
420	450	4	7	121.5	0.03292	0.01619	0.8306	0.1694
480	510	4	9	109.5	0.03653	0.01793	0.8032	0.1968
540	570	4	12	95.0	0.04211	0.02060	0.7739	0.2261
600	630	1	12	79.0	0.01266	0.01258	0.7413	0.2587
660	690	2	7	68.5	0.02920	0.02034	0.7319	0.2681
720	750	0	9	58.5	0.00000	.	0.7106	0.2894
780	810	2	17	45.5	0.04396	0.03039	0.7106	0.2894
840	870	0	4	33.0	0.00000	.	0.6793	0.3207
900	930	0	10	26.0	0.00000	.	0.6793	0.3207
960	990	0	12	15.0	0.00000	.	0.6793	0.3207
1020	1050	0	2	8.0	0.00000	.	0.6793	0.3207
1080	1110	0	2	6.0	0.00000	.	0.6793	0.3207
1140	1170	0	2	4.0	0.00000	.	0.6793	0.3207
1200	.	0	3	1.5	0.00000	.	0.6793	0.3207

		SURVIVAL STD ERROR	PDF	PDF STD ERROR	HAZARD	HAZARD STD ERROR	CONDITIONAL MEDIAN	MEDIAN STD ERROR
0	30	0.0000	8.6E-05	8.6E-05	8.6E-05	8.6E-05	.	.
60	90	0.0051	8.7E-05	8.7E-05	8.8E-05	8.8E-05	.	.
120	150	0.0073	2.7E-04	1.6E-04	2.7E-04	1.6E-04	.	.
180	210	0.0117	5.6E-04	2.3E-04	5.9E-04	2.4E-04	.	.
240	270	0.0177	8.8E-04	2.9E-04	9.6E-04	3.2E-04	.	.
300	330	0.0239	6.1E-04	2.5E-04	7.1E-04	2.9E-04	.	.
360	390	0.0272	3.2E-04	1.8E-04	3.8E-04	2.2E-04	.	.
420	450	0.0288	4.6E-04	2.2E-04	5.6E-04	2.8E-04	.	.
480	510	0.0309	4.9E-04	2.4E-04	6.2E-04	3.1E-04	.	.
540	570	0.0331	5.4E-04	2.7E-04	7.2E-04	3.6E-04	.	.
600	630	0.0355	1.6E-04	1.6E-04	2.1E-04	2.1E-04	.	.
660	690	0.0363	3.6E-04	2.5E-04	4.9E-04	3.5E-04	.	.
720	750	0.0382	0	.	0	.	.	.
780	810	0.0382	5.2E-04	3.6E-04	7.5E-04	5.3E-04	.	.
840	870	0.0424	0	.	0	.	.	.
900	930	0.0424	0	.	0	.	.	.
960	990	0.0424	0	.	0	.	.	.
1020	1050	0.0424	0	.	0	.	.	.
1080	1110	0.0424	0	.	0	.	.	.
1140	1170	0.0424	0	.	0	.	.	.
1200	.	0.0424	.	.	.	.	.	.

NEWSENT DATA--PHASE I CE & PH

LIFE TABLE SURVIVAL ESTIMATES
GROUP1=PH

INTERVAL	MIDPOINT	EVENTS	WITHDRAWALS	EFFECTIVE SIZE	CONDITIONAL PROBABILITY	PROBABLITY STD ERROR	SURVIVAL	FAILURE
0	30	0	2	221.0	0.00000	.	1.0000	0.0000
60	90	4	3	218.5	0.01831	0.00907	1.0000	0.0000
120	150	10	0	213.0	0.04695	0.01449	0.9817	0.0183
180	210	5	1	202.5	0.02469	0.01091	0.9356	0.0644
240	270	5	0	197.0	0.02538	0.01121	0.9125	0.0875
300	330	12	5	189.5	0.06332	0.01769	0.8893	0.1107
360	390	6	6	172.0	0.03488	0.01399	0.8330	0.1670
420	450	9	5	160.5	0.05607	0.01816	0.8040	0.1960
480	510	5	4	147.0	0.03401	0.01495	0.7589	0.2411
540	570	7	7	136.5	0.05128	0.01888	0.7331	0.2669
600	630	5	9	121.5	0.04115	0.01802	0.6955	0.3045
660	690	3	7	108.5	0.02765	0.01574	0.6669	0.3331
720	750	1	12	96.0	0.01042	0.01036	0.6484	0.3516
780	810	1	17	80.5	0.01242	0.01234	0.6417	0.3583
840	870	0	13	64.5	0.00000	.	0.6337	0.3663
900	930	1	14	51.0	0.01961	0.01941	0.6337	0.3663
960	990	1	7	39.5	0.02532	0.02499	0.6213	0.3787
1020	1050	2	5	32.5	0.06154	0.04215	0.6055	0.3945
1080	1110	0	9	23.5	0.00000	.	0.5683	0.4317
1140	1170	0	13	12.5	0.00000	.	0.5683	0.4317
1200	.	0	6	3.0	0.00000	.	0.5683	0.4317

		SURVIVAL STD ERROR	PDF	PDF STD ERROR	HAZARD	HAZARD STD ERROR	CONDITIONAL MEDIAN	MEDIAN STD ERROR
0	30	0.0000	0	.	0	.	.	.
60	90	0.0000	3.1E-04	1.5E-04	3.1E-04	1.5E-04	.	.
120	150	0.0091	7.7E-04	2.4E-04	8.0E-04	2.5E-04	.	.
180	210	0.0166	3.9E-04	1.7E-04	4.2E-04	1.9E-04	.	.
240	270	0.0192	3.9E-04	1.7E-04	4.3E-04	1.9E-04	.	.
300	330	0.0213	9.4E-04	2.6E-04	.0010899	3.1E-04	.	.
360	390	0.0254	4.8E-04	1.9E-04	5.9E-04	2.4E-04	.	.
420	450	0.0272	7.5E-04	2.4E-04	9.6E-04	3.2E-04	.	.
480	510	0.0295	4.3E-04	1.9E-04	5.8E-04	2.6E-04	.	.
540	570	0.0307	6.3E-04	2.3E-04	8.8E-04	3.3E-04	.	.
600	630	0.0322	4.8E-04	2.1E-04	7.0E-04	3.1E-04	.	.
660	690	0.0333	3.1E-04	1.8E-04	4.7E-04	2.7E-04	.	.
720	750	0.0341	1.1E-04	1.1E-04	1.7E-04	1.7E-04	.	.
780	810	0.0344	1.3E-04	1.3E-04	2.1E-04	2.1E-04	.	.
840	870	0.0349	0	.	0	.	.	.
900	930	0.0349	2.1E-04	2.1E-04	3.3E-04	3.3E-04	.	.
960	990	0.0363	2.6E-04	2.6E-04	4.3E-04	4.3E-04	.	.
1020	1050	0.0387	6.2E-04	4.3E-04	.0010582	7.5E-04	.	.
1080	1110	0.0444	0	.	0	.	.	.
1140	1170	0.0444	0	.	0	.	.	.
1200	.	0.0444	.	.	.	.	.	.

NEWSENT DATA--ALL CONTROLS AND EXPERIMENTALS

LIFE TABLE SURVIVAL ESTIMATES
GROUP=C

INTERVAL	MIDPOINT	EVENTS	WITHDRAWALS	EFFECTIVE SIZE	CONDITIONAL PROBABILITY	PROBABLITY STD ERROR	SURVIVAL	FAILURE
0	30	0	8	214.0	0.00000	.	1.0000	0.0000
60	90	1	13	203.5	0.00491	0.00490	1.0000	0.0000
120	150	4	17	187.5	0.02133	0.01055	0.9951	0.0049
180	210	11	21	164.5	0.06687	0.01948	0.9739	0.0261
240	270	4	21	132.5	0.03019	0.01486	0.9087	0.0913
300	330	3	12	112.0	0.02679	0.01526	0.8813	0.1187
360	390	0	13	96.5	0.00000	.	0.8577	0.1423
420	450	4	13	83.5	0.04790	0.02337	0.8577	0.1423
480	510	3	8	69.0	0.04348	0.02455	0.8166	0.1834
540	570	3	7	58.5	0.05128	0.02884	0.7811	0.2189
600	630	0	7	48.5	0.00000	.	0.7410	0.2590
660	690	2	8	41.0	0.04878	0.03364	0.7410	0.2590
720	750	0	7	31.5	0.00000	.	0.7049	0.2951
780	810	1	11	22.5	0.04444	0.04345	0.7049	0.2951
840	870	0	3	14.5	0.00000	.	0.6736	0.3264
900	930	0	5	10.5	0.00000	.	0.6736	0.3264
960	990	0	4	6.0	0.00000	.	0.6736	0.3264
1020	1050	0	1	3.5	0.00000	.	0.6736	0.3264
1080	1110	0	2	2.0	0.00000	.	0.6736	0.3264
1140	.	0	1	0.5	0.00000	.	0.6736	0.3264

		SURVIVAL STD ERROR	PDF	PDF STD ERROR	HAZARD	HAZARD STD ERROR	CONDITIONAL MEDIAN	MEDIAN STD ERROR
0	30	0.0000	0	.	0	.	.	.
60	90	0.0000	8.2E-05	8.2E-05	8.2E-05	8.2E-05	.	.
120	150	0.0049	3.5E-04	1.8E-04	3.6E-04	1.8E-04	.	.
180	210	0.0115	.0010854	3.2E-04	0.001153	3.5E-04	.	.
240	270	0.0218	4.6E-04	2.3E-04	5.1E-04	2.6E-04	.	.
300	330	0.0251	3.9E-04	2.2E-04	4.5E-04	2.6E-04	.	.
360	390	0.0279	0	.	0	.	.	.
420	450	0.0279	6.8E-04	3.3E-04	8.2E-04	4.1E-04	.	.
480	510	0.0333	5.9E-04	3.4E-04	7.4E-04	4.3E-04	.	.
540	570	0.0376	6.7E-04	3.8E-04	8.8E-04	5.1E-04	.	.
600	630	0.0422	0	.	0	.	.	.
660	690	0.0422	6.0E-04	4.2E-04	8.3E-04	5.9E-04	.	.
720	750	0.0472	0	.	0	.	.	.
780	810	0.0472	5.2E-04	5.1E-04	7.6E-04	7.6E-04	.	.
840	870	0.0546	0	.	0	.	.	.
900	930	0.0546	0	.	0	.	.	.
960	990	0.0546	0	.	0	.	.	.
1020	1050	0.0546	0	.	0	.	.	.
1080	1110	0.0546	0	.	0	.	.	.
1140	.	0.0546	0	.	0	.	.	.

NEWSENT DATA--ALL CONTROLS AND EXPERIMENTALS

LIFE TABLE SURVIVAL ESTIMATES
GROUP=E

INTERVAL	MIDPOINT	EVENTS	WITHDRAWALS	EFFECTIVE SIZE	CONDITIONAL PROBABILITY	PROBABLITY STD ERROR	SURVIVAL	FAILURE
0	30	1	16	224.0	0.00446	0.00445	1.0000	0.0000
60	90	1	7	211.5	0.00473	0.00472	0.9955	0.0045
120	150	4	13	200.5	0.01995	0.00988	0.9908	0.0092
180	210	4	10	185.0	0.02162	0.01069	0.9711	0.0289
240	270	5	23	164.5	0.03040	0.01338	0.9501	0.0499
300	330	5	25	135.5	0.03690	0.01620	0.9212	0.0788
360	390	4	14	111.0	0.03604	0.01769	0.8872	0.1128
420	450	2	14	93.0	0.02151	0.01504	0.8552	0.1448
480	510	1	16	76.0	0.01316	0.01307	0.8368	0.1632
540	570	1	17	58.5	0.01709	0.01695	0.8258	0.1742
600	630	1	14	42.0	0.02381	0.02352	0.8117	0.1883
660	690	0	5	31.5	0.00000	.	0.7924	0.2076
720	750	0	3	27.5	0.00000	.	0.7924	0.2076
780	810	1	6	23.0	0.04348	0.04252	0.7924	0.2076
840	870	0	1	18.5	0.00000	.	0.7579	0.2421
900	930	0	5	15.5	0.00000	.	0.7579	0.2421
960	990	0	8	9.0	0.00000	.	0.7579	0.2421
1020	1050	0	1	4.5	0.00000	.	0.7579	0.2421
1080	1110	0	0	4.0	0.00000	.	0.7579	0.2421
1140	1170	0	1	3.5	0.00000	.	0.7579	0.2421
1200	.	0	3	1.5	0.00000	.	0.7579	0.2421

		SURVIVAL STD ERROR	PDF	PDF STD ERROR	HAZARD	HAZARD STD ERROR	CONDITIONAL MEDIAN	MEDIAN STD ERROR
0	30	0.0000	7.4E-05	7.4E-05	7.5E-05	7.5E-05	.	.
60	90	0.0045	7.8E-05	7.8E-05	7.9E-05	7.9E-05	.	.
120	150	0.0065	3.3E-04	1.6E-04	3.4E-04	1.7E-04	.	.
180	210	0.0117	3.5E-04	1.7E-04	3.6E-04	1.8E-04	.	.
240	270	0.0154	4.8E-04	2.1E-04	5.1E-04	2.3E-04	.	.
300	330	0.0196	5.7E-04	2.5E-04	6.3E-04	2.8E-04	.	.
360	390	0.0241	5.3E-04	2.6E-04	6.1E-04	3.1E-04	.	.
420	450	0.0280	3.1E-04	2.1E-04	3.6E-04	2.6E-04	.	.
480	510	0.0303	1.8E-04	1.8E-04	2.2E-04	2.2E-04	.	.
540	570	0.0318	2.4E-04	2.3E-04	2.9E-04	2.9E-04	.	.
600	630	0.0343	3.2E-04	3.2E-04	4.0E-04	4.0E-04	.	.
660	690	0.0385	0	.	0	.	.	.
720	750	0.0385	0	.	0	.	.	.
780	810	0.0385	5.7E-04	5.6E-04	7.4E-04	7.4E-04	.	.
840	870	0.0499	0	.	0	.	.	.
900	930	0.0499	0	.	0	.	.	.
960	990	0.0499	0	.	0	.	.	.
1020	1050	0.0499	0	.	0	.	.	.
1080	1110	0.0499	0	.	0	.	.	.
1140	1170	0.0499	0	.	0	.	.	.
1200	.	0.0499	.	.	.	.	.	.