On Architecture for Justice: A Translog Analysis of Capital Construction and Spatial Expansion as Panacea for Facility Crowding in Nigeria and New York

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Abstract
Crowding in correctional facilities is a major problem that has continued to overwhelm correctional policy makers. Although this problem has always existed, it has of late taken on added importance due to diminishing public resources, especially needed funds for new prison construction and the heightened publicity that the crime problem has received. The negative effects of crowding in correctional facilities often culminate in riots. When these riots occur, public attention becomes focused on crime and the criminal and questions begin to be asked about conditions in correctional facilities. Partly as a result of misperception of public opinion with regard to punishment and partly because of lack of the will to try other solutions, policy makers often resort to prison spatial or capacity expansion programs(new construction and rehabilitation of existing ones) as a panacea. It becomes the major means of reducing crowding in correctional facilities. To create more prison space, policy makers are inclined to increase correctional capital expenditures while neglecting alternatives to incarceration expenditures. This study investigates this phenomenon as it applies to the Federal Republic of Nigeria and the State of New York, USA. The study also looks at crime rates as they affect crowding in correctional facilities in the said entities. The method of analysis involves development of a Translog (Transcendental logarithmic) model. The model was estimated using Ordinary Least Squares method, with Crowding as the dependent variable and capital construction expenditures, alternatives to incarceration expenditures and crime rates as independent or explanatory variables. The results of the study indicate that alternatives to incarceration expenditures appear to be more effective in reducing crowding in correctional facilities than capital construction expenditures. The result also shows that crime rates are positive determinants of crowding.
Keywords: Crowding, Over-crowding, Architecture for Justice, Capital Construction Expenditures, Construction Expansion, Spatial Expansion, Correctional Facility, Prison, Alternatives to Incarceration Expenditures, Translog Functions

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INTRODUCTION

This work is predicated on the premise that the problem of crowding in correctional facilities engenders systemic construction expansion and precipitate the tendency for policy makers to increase correctional capital construction expenditures, without proper consideration for their effectiveness as a means of reducing crowding in correctional facilities.

It seems that this inclination to pursue a policy of massive correctional facility construction develops as a public response to crowding consequences in these institutions. One of these consequences is the predisposition of correctional facility inmates to resort to rioting as a way of venting their frustrations at the established authorities. This frustration, of course, results from what the inmates consider sub-standard and unacceptable living conditions. Evidence (Elias 1968; Barrantes 1980; Fennell 1983) seems to suggest that this problem of crowding in correctional facilities is a universal concept - it is not unique to a particular region or country.

In the United States, for instance, a flurry of correctional facility construction activity came as an answer to the riots that occurred in several correctional facilities in the 1970s due to crowded conditions. One such riot in the United States of America, which was particularly responsible for awakening the nation to the tremors of unhealthy conditions in correctional facilities, was the Attica riot of September 1971. When the riot was over, 43 persons lay dead.

Following this incident, the attention of the judiciary, the legislature, the executive and the general public became focused on the general conditions in correctional facilities. To this end, a spate of litigations originating from concerned prison interest groups swamped the courts, resulting in judicial directives to reduce crowding in various state facilities. The State of Arkansas became the first state to have confinement in its penal system ruled as cruel and unusual punishment under the Eight Amendment of the United States Constitution (Harriman and Straussman, 1983). Holt v. Sarver, otherwise known as Holt I, was the first in a series of litigations in Arkansas that began in 1969. Besides critically crowded facilities, orders from the court covered the elimination of the trustee guard system, inmate safety, brutality and reprisals, racial segregation, medical service and general sanitation levels.

Similar court orders became the vogue across the nation. New York, Ohio, Mississippi, Oklahoma, Florida, Louisiana, Alabama, Delaware, etc., all had court orders to improve conditions in their correctional facilities.

The immediate net effect of this trend was a tremendous increase in correctional capital construction expenditures with its attendant prison construction activity. State authorities became, more or less, compelled to expand their correctional facilities, resulting in capital construction expenditure increases. A study done by Harriman and Straussman (1983) showed that out of a sample of 14 states studied, only two states did not experience increase in their correctional capital expenditures. The study did a comparison of expenditures before and after court-ordered action. After three years of such court decision in Wyoming, the average yearly capital expenditures per state inmate increased by 744 percent. In Oklahoma it was 454 percent, but merely 15 percent in Delaware.

Perhaps, it is in order to ask why correctional facilities have become so crowded as to elicit such court orders. It appears that several factors are responsible for this problem: worsening economic conditions; changing crime rates; changing judicial attitudes towards offenders; changing standards for parole activities; growing conservatism in the nation's political mood, requiring the legal system to respond more severely to the crime problem.

As the general public became more conscious of rising crime rates, it was rationalized that weaknesses in the judicial system was to blame. This attitude generated an unprecedented high level of pressure on law makers to enhance the severity of sentences on convicts. Consequently, the use of indeterminate sentencing as a valid tool of the judiciary became questionable. Arguments were made in favor of longer and more definite terms of imprisonment (Cory and Gettinger 1984). As a result of this public attitude, judges were inclined to sentence many non-violent offenders to terms of imprisonment instead of using available alternatives. Ordinarily, some of these offenders would have received sentences that were exclusive of imprisonment. As the profile of offenders sentenced to prison broadened to include non-violent offenders, the result was an unprecedented increase in prison population.

In Nigeria, crowding as a problem in correctional facilities dates back to the late 1800s (Awe in Elias 1968). Inmate riots, due to crowding and other bad conditions, occurred in Lagos Broad Street Prison in 1952 and subsequently in 1953. Whereas this facility was designed for 300 inmates, it was inhabited by 714 inmates. In response to the riots, the colonial administration at the time demolished the physical structure, replacing it with a much larger facility.

In 1985, inmates in another Lagos correctional facility engaged in riots, protesting the unsanitary and crowded conditions prevalent in the facility (West Africa, October 1985). Indeed, when a political prisoner of a previous administration was released from the Enugu Prison (correctional facility), he had cause to speak out,

criticizing the crowded and unhealthy conditions of the Nigerian correctional facilities. In his post-release press conference, the erstwhile minister pleaded with the ruling military government to give due consideration to the plight of the Nigerian inmate and the unwholesome conditions of the facilities.

This paper begins with a problem statement. Here, the concept of capital construction expenditure as a faltering solution to the problems of correctional institution crowding is succinctly reviewed. Section Two is a broad review of relevant literature on corrections, covering the specific issues of crowding, capital construction programs, alternatives to incarceration, and crime rates.

Section Four is a discussion of the hypotheses intended for this research. These were developed from the salient facts drawn from the literature.

Sections Five and Six are discussions of the method of research used for this study. This includes data gathering and analysis, employing the method of regression analysis using ordinary least squares for evaluating the various variables included in the hypotheses. In Section Five, the method of Translog functions for formulating the model is introduced. This was done after it was detected that some of the hypotheses were not empirically testable due to co-linearity. These sections also include the results and discussion of the empirical work.

In Section Six, we make conclusions about this study and analyze its implications for policy.

1.1 General Statement of the Problem

The objective of this study is to examine the effectiveness of the policy of building more correctional facilities as an answer to society's quest for curing the crowding problem. By doing this we also examine whether capital construction programs leading to spatial expansion as panacea for reducing or even eliminating crowding in correctional facilities is a valid tool for corrections and Justice. In doing this, the study investigates the effectiveness and nature of alternatives to incarceration programs, to determine whether public policy should be focused more on utilizing these programs while relying less on incarceration.

Although crowding in correctional facilities is not a completely new phenomenon, the crisis atmosphere witnessed by many correctional facilities during the 1970s and 1980s has made it one of the most discussed issues. The correctional industry witnessed a decline in inmate populations during the 1960s. This trend began to reverse in the early 1970s. By 1973, there was such a tremendous surge in inmate population, that by 1983 the prison population in the United States had doubled, far exceeding the capacity of the available facilities.

A consequence of this trend of events was a dramatic increase in correctional capital construction expenditures. Specifically, from 1970 to 1980, correctional capital construction expenditures in the United States increased from 74 million dollars to 450 million dollars. By 1982, the expenditures increased to nearly 1 billion dollars (Cory and Gettinger 1984).

A 1981 survey by the United States Department of Justice, found that 47 out of the 50 states were in the process of building new correctional facilities. According to the survey, 717 new correctional facilities (six federal, 231 states, 480 local) were under construction or consideration at a cost of at least 5.6 billion dollars.

In 1980, researchers at Abt Associates, commissioned by U.S. Congress, studied the future needs of the United States correctional systems. Their conclusion was significant. They concluded that prisons were "capacity driven". In other words, the greater the capacity of the penal system, the greater the rate of incarceration. This study further revealed that on the average, new facilities were 30 percent over capacity within five years.

In this paper, two geographical entities are used as models. These entities are the state of New York in the United States of America and the Federal Republic of Nigeria. These problems are analyzed empirically as they exist in the two correctional systems. To the extent that this problem is universal, this study commences on a predication that even though there may be vast differences (e.g. cultural, political, economic etc.) between Nigeria and New York, some common ground could still be found. This is especially the case with correctional facility crowding. There might be a difference, though, as to the degree of occurrence. There might also be a difference with respect to procedures for resolving these problems. Nonetheless, a review of the history of correctional systems everywhere might suggest that they all share the same basic philosophy. This trend of development, it appears, could be common to both New York and Nigeria.

The interest in New York State as a model for this study lies in its importance and prominence in the correctional systems in the United States. This prominence is illustrated in the transformation that its correctional system has undergone over the years. Starting with one facility (Newgate) in 1797, the system expanded to about 50 facilities as at 1987 and more facilities had been built since. Further, New York has the second highest inmate population in the United States, next to California.

The interest in Nigeria stems from its leading role in Africa, as an emerging nation. With a largely oil-dependent economy and as the most populous country in Africa, it is of interest to examine its approach to resolving the universally overwhelming problem of prison crowding. By looking at these two models, it is hoped that some light would be shed and groundwork established for future evaluation of policies dealing with capital construction projects and crowding in correctional facilities. It will also serve as a primer for architects and other

professionals involved in prison design and construction.

2.0 REVIEW OF LITERATURE

As shown in the foregoing, the problem of crowding in correctional facilities has caused a great deal of concern for the society. Associated with this concern is the issue of how to contain crime and therefore resolve the afore-mentioned problem. To this end, questions have been asked as to how these problems should be resolved. Should more public funds be committed to prison construction at the expense of other programs that the society needs very badly? How effective is incarceration as a form of punishment? Are prison rehabilitation programs effective for reforming the criminal? Does the failure of prison rehabilitation programs explain increasing recidivism leading to crowding? What are the effects of crowding on the behavior of correctional facility inmates? These questions have become the subject of discussions among many a researcher and policy maker.

In this review, literature relevant to the main variables that are the subject of this study and other related variables are reviewed with a view to providing some answers to the afore-mentioned questions. Much of this literature will later feature as support for the hypotheses being proposed in this study.

We begin by examining the literature dealing with the main variable, crowding. With reference to this particular variable our purpose in this review is to elicit the extent and complexity of its effects and hence to show it as a problem that merits a thorough analysis.

3.0 CROWDING

A good source of literature on crowding is the field of environmental psychology. Although some of the theories propagated in this field do not make direct or explicit reference to crowding in correctional facilities, their essence is salient in understanding the general effects of crowding on the behavior of individuals, especially when they are confined to a restricted environment. Besides these works, there exists a corpus of literature in this field which focuses specifically on crowding in correctional institutions. This body of work is of special interest to this study as it will help lend some credence to the assertion that crowding is a very serious problem.

The discussions that follow deal mainly with whether crowding is a direct effect of the physical environment itself or of various personal and situational factors that sensitize individuals to the experience of crowding.

"Density intensity" theories (Levy 1979) define crowding as the situation in which the individual is exposed to high density, or in which he or she is "being crowded". According to this view, being crowded has an enhancing effect on feelings and behavior that is independent of its effective impact or stressfulness. Research in this area supports the idea that high density may have both aversive and positive consequences and that the effect of "being crowded" may be independent of a person's subjective evaluation of "feeling crowded" (Levy 1979). In another set of theories, called the "felt discrepancy" theories, it is posited that crowding is an experience perceived by the individual, a "felt discrepancy" between the person's desired and actual environments. This discrepancy can be experienced as restricted movement, scarce resources, security threats, lack of availability of meaningful roles, or infringement on privacy.

Within this realm, crowding may be conceptualized as a phenomenological experience which arises when the demand for space exceeds the available supply (Stokols 1972), as a motivational state involving the restriction of behavioral choice (Ittelson et al. 1970) or as the desire for increased privacy (Altman 1975) or for reduced social stimulation (Baum and Valins 1973; Desor 1972; Milgram 1970). In order to reduce the salience of this perceived crowding, people may use cognitive, perceptual and behavioral methods of coping; stress may occur if coping strategies are unsuccessful. This stress may result in social withdrawal (Baum, Ries and O'Hara 1974; Bickman, Teger and Gabrielle 1973; Valins and Baum 1973), selective inattention (Saegert 1977), lowered task performance (Corah and Boffa 1970; Glass and Singer 1972), and aggression against the physical environment or against, others (Marrero and Markowitz 1977). This may be especially true in restricted environments where there is little change to avoid stress and little perceived control over the environment.

There is a direct connection between the phenomena of crowding and privacy. Privacy, according to Altman (1974), is "the selective control over access to the self or to one's group".[1] Further, Goffman (1961) and Jourard (1966) have tried to demonstrate the critical role of privacy for the self-identity and self-esteem of institutional residents.

Personal space or interpersonal distance is defined as the distance separating two or more individuals which may result from variables such as "the culture, the status, the personality of the individuals involved, their feelings towards each other and the nature of the environment" (Hall 1959). To this end, personal space can be regarded as a privacy mechanism, the violation of which may be a basis for discomfort, tension or conflict.

Several studies with both adult inmates (Curran, Blatchley and Hanlon 1978; Hildreth, DeRogatis and

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[1] Altman Privacy: A Conceptual Analysis in D. Carson (Ed.) Man-Environment Interactions and Applications: Evaluations and Applications (pt. 2). (Stroudsbourg, Pa.: Dowden, Hutchinson and Ross, 1974) p.4

McCusker 1971; Kinzel 1970) and with deviant adolescents (Lothstein 1974; Newman and Pollack 1973) have tended to support the idea that inmates have large body buffer zones and personal space needs. These may result in increased need for privacy and security. Fleishing (1973), Flynn (1979), McReynolds (1973) indicate that the territorial behavior observed among correctional facility inmate groups may become aggressive if privacy or the option to demarcate a personal area is not provided.

Still another set of theories of crowding derives from various socio-cultural determinist views of the environment. Among these views is one that sees crowding in terms of "manning", the amount of manning being the ratio of behavioral settings to the number of residents available to maintain those settings. Manning is based on the assumption that all behavioral settings have essential tasks or functions that are associated with specific requirements.

One of the proponents of this idea is Wicker (1976) who submits that crowding is an "over-manned" condition in which the number of eligible participants exceeds the personnel capacity of the available behavior settings in a system. Wicker suggests that the degree of manning in a behavior setting may be more critical in determining the individual's perception of crowding than the physical parameters or available space supply. Therefore, even in low density conditions, an over-manned setting will cause greater degrees of felt crowding due to the scarcity of meaningful roles which one might occupy.

Similarly, Moos (1978), in his social climate research has emphasized that institutional size, staffing ratio, and other similar factors, may facilitate or inhibit individual participation in the environment.

Significantly, it appears that most of these studies on crowding were conducted in controlled laboratory settings. As Ferbstein, Wener, and Gomez (1979) pointed out, "Because real world conditions often include exposure to high density situations, there are especially severe problems with laboratory research which is by nature short term and voluntary". Due to the persistence of conditions of high spatial density and crowding in many correctional facilities, the issue of negative effects of high density on humans is a crucial one in the correctional environment. However, it is difficult in research to divorce the effects of high density from other stresses of prison settings, such as the loss of personal control which in a felt discrepancy model would account for crowding effects. It seems that many of the pathological effects of high density are more likely to occur in populations where there is minimal control over environmental effects (Cold Phillips 1979). Toch (1979), for example, found that inmates rarely objected to physical density itself but rather to the difficulty of escaping observation, to the violation of privacy, and to the intrusion of noise along with other assaults on the senses. But this finding begs a question since all these conditions are invariably affected by the level of density in a particular setting.

On the effects of crowding on inmates, some studies have tried to demonstrate that there is a negative physiological effect resulting from high spatial density and perceived crowding in correctional facility environments. D'Atri (1977) measured inmates' pulse and blood pressure in three correctional institutions with varying modes of housing, including single cells, double occupancy cells, and dormitory settings. When length of time in the institution was controlled, D'Atri found that both black and white inmates in dormitories across the three prisons had consistently higher diastolic and systolic blood pressure and higher pulse rates than did those in one- or two-person cells. Separate multiple regression analyses of the data from each institution revealed that housing mode was the only variable that was significantly related to blood pressure. Inmates' self-reported perceptions of the degree of crowding and of the attitude of guards were found to be related to blood pressure levels, with those inmates who viewed the prison as crowded and the guards as "harsh" tending to have higher blood pressure. Significantly, blood pressure tended to be high at the beginning of incarceration, probably due to the initial shock of confinement, then declined somewhat, possibly as the shock faded. After a month, they gradually increased over time, perhaps due to the accruing stress of crowding and confinement.

The studies of Paulus, McCain, and Cox (1978) lend some support to these findings. They examined the perceived crowding and blood pressure levels of inmates living in two-man cells with 29 square feet per inmate and inmates in three-and six-man cells both with 19 square feet per inmate. The setting was a 2400-population maximum security institution. Their analysis of blood pressure results indicated significant differences in systolic blood pressure between inmates in the three-and six-man cells and those in the two-man cells. The same analysis for diastolic pressure was not significant. Perceived crowding was found to be more strongly related to spatial density, i.e., square feet (square meters) per man than to social density.

Paulus et al. (1978) also analyzed archival data from ten state correctional institutions which related changes in population to corresponding variations in death and psychiatric commitment rates.

Significantly high death rates were found over years of high population periods. Deaths attributed to diseases of the circulatory system were also found to be significantly different when low and high population years were compared. Finally, using data from two institutions on the number of commitments to a psychiatric center from 1953-1969, the researchers found a strong positive association between commitment rates and higher total populations. A note of caution though, is that the findings may only reflect the poorer quality of medical care available during times of high population.

Paulus, Cox, McCain, and Chandler (1975) investigated illness complaint rates for subjects who were housed for a minimum of 30 days in either a dormitory setting (with 26 or more inmates) or one-and two-man cells. The study revealed greater number of illness complaints per capita in dormitories than in one-and two-man cells. Similar results were found between levels of spatial/social density and illness complaints at a county jail. These results are consistent with those reported by Werner and Keys (1979), who found that small population increases in jail units caused significant increases in perceived crowding and the rate of sick calls, and with the finding of Ray, Huntington, Ellisor, and Wandersman (1979) that the incidence of illness reports correlated with density in two juvenile institution dormitories.

In conclusion, the existing studies on the effects of crowding in correctional facilities provide evidence that high spatial density and perceived crowding are related to increases in the occurrence of inmate misconduct, to negative changes in the perceived social climate and interpersonal relationships, and to negative health effects. Although crowding research in prisons has been hampered by the difficulty of separating the effects of spatial or social density from other institutional factors, it appears that the stresses of imprisonment (e.g., lack of privacy or resources, staff-inmate tension) may be intensified by crowding.

These crowding effects do have economic implications, implications that become evident in the nature of increased correctional expenditures aimed at providing remedial measures and increase in prison construction and expansion activity. In fact, it is now a matter of historical trend that when these crowding effects become so aggravated as to find expression in inmate riots, public officials tend to respond by engaging in expansion programs and increasing capital construction expenditures.

Although the focus of the empirical effort in this study will be *on* the effects on crowding as opposed to the effects *of* crowding, understanding the latter helps shed some light on why crowding must be considered a problem. It also helps us understand the connection between crowding and inmate riots. The explication offered for inmate behavior under crowded conditions helps shed some light on the underlying causes of riots in correctional facilities. What follows is a review of literature dealing with some variables that do have obvious effects on crowding. These include such variables as capital construction programs, alternatives to incarceration programs and crime rates. It is hoped that by so doing a theoretical ground work on the effects of these variables on crowding would be established.

3.1. Capital Construction Programs

Of some considerable significance to this study is literature that deals with correctional facility construction as a solution to the crowding problem. Before delving into this corpus of work, we note that the idea of correctional facility construction has as its primary objective the provision of more prison space for incarceration purposes. In effect, this is the basis for the notion, "Architecture for Justice". For this reason, in this section, we will not only review literature that deals strictly with capital construction in corrections, but also literature that deals with incarceration.

From 1970 to 1980, correctional capital construction expenditures in the United States rose from 74 million dollars to 450 million dollars. By 1982 this amount had increased to 946 million dollars (Dodge 1982). A survey conducted by the U.S. Department of Justice indicated that 47 out of the 50 U.S. states were in the process of building new correctional facilities. As the following literature will show, the propensity to build new correctional facilities has an obvious relationship to crowding and judicial practices (Abt Associates 1980; Nardulli 1983; Finn 1984). As stated earlier, the study by Abt Associates found that prisons are "capacity driven", meaning that the greater the capacity of the penal system, the greater the rate of incarceration. In other words, judges are more inclined to impose sentences of imprisonment when spaces are available than when prison spaces are lacking. This study further showed that correctional facilities are 30 percent over capacity within five years of construction.

Nardulli's study investigated factors that affect sentencing severity and how these influence prison capacity. The study used the states of Illinois, Michigan and Pennsylvania as case studies. The study was done at a time when the state of Illinois was adopting a "get tough" policy approach in dealing with its criminal offenders. As reported by Nardulli, Illinois moved from indeterminate to a determinate sentencing code, abolished its parole board and enacted Class X legislation providing more severe sentences for selected heinous crimes. With the stricter sentencing practices carne a dramatic increase in its correctional facilities' inmate populations, requiring that Illinois prison capacity be increased. To this end, for the 1983 fiscal year, the Illinois Department of Corrections received 75 percent of all new capital project funds allocated for the whole state.

Nardulli's study is significant in its findings. In examining sentencing severity across the three states, it was found that cases in Michigan received much more severe sentences than those in Illinois and Pennsylvania. This variation in sentencing severity is attributed to the greater detention capacity of the Michigan penitentiary system--as well as to its medium security and decentralized orientation and, perhaps, its qualitative advantages. The study, however, found no significant difference between Illinois and Pennsylvania when offense and criminal records were controlled. It was also found that prison construction programs had some influence on "get

tough" policies. Judges and prosecutors, it appears, seem perfectly willing to fill up the penal facilities if the executive and legislative branches provide the space, especially during periods of great public outcry against crime.

In another study, Nardulli (1983) investigated the relationship between crime rates, increasing correctional expenditures, crowding and sentencing policies of the state of Illinois. The study examined these relationships as they affect Illinois counties. The results indicated that Illinois counties differ in their sentencing policies and in their consumption of the state's correctional resources. Interestingly, the study showed that there is some economic incentive to "over incarcerate". This implies that prison space, although extremely expensive ($70,000-$90,000 for one maximum security cell; $40,000-$50,000 for a medium security cell; $12,000-$14,000 in operating costs per inmate per year), may constitute "free goods" to the counties that use them. In Illinois, the counties that send inmates to state facilities are not charged a user fee. If, however, the inmates are kept in local facilities, the county must bear the costs. The study also shows that the policies of high user counties had no greater impact on crime rates than those of low user counties.

In other words, "get tough" policies do not have any significant impact on crime. Even when crime rates stabilized, incarceration rates were increasing in these counties. The study further shows that crowding in Illinois facilities was due to the fact that many offenders who were incarcerated were sent there because of pressure on judges to impose more severe sentences. Some of these offenders who were sentenced for non-violent offences could have gotten non-incarceration sentences prior to the new legislation.

Nardulli's findings support Petersilia and Greenwood's (1978) findings. Petersilia and Greenwood (1978) had studied the effects of mandatory prison sentences on crime and prison populations. The study tried to quantify the amount of crime prevented by imposing sentences of varying lengths on specific classes of offenders and the impact of mandatory penalties on prison population. The study showed that mandatory-minimum sentence policies can reduce crime through incapacitation effects, but substantial increases in prison populations will be required to achieve modest reductions in adult crime. The study showed that for a one percent reduction in crime, prison populations must increase by three to ten percent, depending on the target population to be sentenced.

Finn's study investigated judicial attitudes towards crowding, the impact of crowding on sentencing, and judges' attitude towards alternative to incarceration. The study involved a telephone interview of a judge in each of 31 states. The states studied were representative of every region of the U.S. Each of the judges was recommended by his/her state's department of corrections as the jurist most knowledgeable about the impact of prison crowding on that state's judicial sentencing practices.

The survey showed that nearly half (15) of the judges indicated that the capacity of correctional facilities in their states has been a factor in the sentencing decisions of felony court judges. Over half of the judges interviewed indicated that prison crowding had not affected their sentencing behavior, because either that inmate populations are not excessive in their jurisdiction or that juries impose most sentences.

Of some significance is the fact that the interview showed that the judiciary now examines and considers incarceration alternatives more carefully than in the past. Alternatives are used for non-violent first offenders depending on the crowding situation in the correctional system.

Attempts have been made to link not only crowding and judicial decisions (Finn 1984), but also, crowding, judicial decisions and state expenditures (Harriman and Straussman 1983). To this end the argument is made that crowded conditions in correctional facilities influence judges' decisions and these decisions in turn affect expenditures in states. This argument implies that when judges give orders to states to decongest their correctional facilities, such orders often result in the affected states embarking on massive prison construction programs that inevitably entail large increases in correctional capital construction budgets and expenditures.

Harriman and Straussman (1983) investigated this phenomenon in order to determine the budgetary impact of judicial decisions. Specifically, the study focused on 14 states that had faced court-mandated reforms before 1979. The study was to determine whether these states increased their capital expenditures after they faced litigation. The states studied included Arkansas, Ohio, Mississippi, Oklahoma, Florida, Louisiana, Alabama, Delaware, New Hampshire, Wyoming, Rhode Island, Massachusetts, Maryland and Missouri. Out of these states, the study showed that Ohio and Massachusetts were the only states to show a decrease in capital expenditures after their first federal court decision. The other twelve states indicated significant increases in their capital expenditures. This suggests that the majority of the states responded to their respective initial decisions with an increased level of capital expenditures.

The budgetary effect of judicially mandated prison reform was further examined by looking at correctional capital expenditures as a proportion of total state spending. This showed that capital expenditures, as a proportion of total state budget, increased in 12 of the 14 states, further supporting the evidence that many states responded to the first court decisions by increasing prison capacity. The study also indicated that overall spending on corrections as a percentage of the total state budget increases after a court decision.

Harriman and Straussman further compared the planned expansion of beds for the 14 states affected by

judicial decisions before 1979 with 18 states that had no state prison court cases as of 1980. This showed that states under a court order had larger increases in planned beds than states that were not under a court order.

Related to these findings were the findings for per capita spending per inmate. The evidence in this connection suggests that the levels of per capita spending per inmate in states that have had court orders were, in general, lower than that of states that did not have court orders. However, available data on expenditures suggest that the courts have forced states that have been defendants in prison condition cases to spend closer to the level of states that had not experienced court orders.

As the evidence seems to suggest in the foregoing, there is a relationship of sorts between sentencing practices and crowding in correctional institutions. There is also a relationship between sentencing practices and capital construction expenditures. Both variables (sentencing practices and capital construction) are linked together by crowding. As the above literature has tried to show, these three variables are somewhat inter-related. The relationship tends to resemble a "vicious circle", such that the behavior of one variable determines the behavior of the other variable. To this extent, tougher sentences by judges resulting from public pressure and legislative actions, lead to crowding. Crowding then influences judicial practices, which in turn leads to increases in capital construction expenditures. But then, as Nardulli (1983) points out, increased prison space resulting from increased capital expenditures leads to judges sentencing more offenders to prison. If prison space is unavailable due to crowding, judges are inclined to consider other alternatives (Finn 1984).

In spite of the support enjoyed by correctional capital construction programs among some legislators, other legislators, particularly those at the federal level, have sought ways of discouraging such a policy. It was to this end that the Sentencing Improvement Act was introduced in the United States congress by senators Nunn and Armstrong (1983). The purpose of the bill was to encourage the prudent use of prison space, by limiting incarceration to certain categories of offenders while proposing alternative forms of punishment for others. The act was also to encourage reduction in correctional capital and operating expenditures.

The main elements of this bill proposed to create presumptions that persons convicted of specified dangerous offenses should be imprisoned, while certain non-violent offenders should be punished using non-incarceration sanctions such as community service and restitution. The bill emphasizes that available prison resources should be used only where violent and dangerous criminals are involved. The principle underlying the act is that incarceration is not always the appropriate punishment for certain types of criminal offenses. According to Armstrong (1981), the act "reflects a growing dissatisfaction with American prisons, which are critically overcrowded, worth millions of dollars, and do little to rehabilitate the hundreds of thousands of prisoners currently incarcerated".

The bill would establish a presumption that imprisonment is an inappropriate sanction for offenses which do not involve the threat or use of force, endanger national security or threaten or cause serious physical harm to others. These presumptions would be inapplicable in cases where: 1) the defendants livelihood depends on criminal conduct; 2) the defendant was paid or expected payment to commit the crime; 3) the offense involved narcotics trafficking; 4) the defendant was convicted of violating specified firearms or explosives laws; 5) the defendant was convicted of misusing his public office; 6) there are specified substantial and compelling reasons for imposing a sentence of imprisonment.

For those non-violent offenses protected by the presumptions, the bill prescribes two forms of non-incarceration alternatives: 1) restitution and 2) community service.

In conclusion, available data on correctional capital construction programs suggest that a relationship exists between crowding in correctional institutions, changes in judicial practices and propensity towards capital construction programs. This relationship exhibits a "vicious circle" pattern where the interdependency of these variables means that one variable determines the others and vice versa. Evidence also suggests that the predisposition on the part of policymakers to embrace capital construction programs as a viable solution to prison crowding, is usually determined by misperceptions of public opinion by policy makers. However, some policy makers have recognized the apparent futility of this policy approach and are encouraging the use of other alternatives.

3.2 Alternatives to Incarceration

Perhaps the Sentencing Improvement Act (1983) authored by Nunn and Armstrong (1983) underscores the importunate status that the appeal for changes in the traditional modes of penal justice has assumed. This appeal, as illustrated by the act, proposes that policy makers encourage changes in sentencing in favor of non-incarceration sanctions, especially in cases involving non-violent offenses. To this end, among the programs that have been suggested as possible alternatives to incarceration are: intensive probation, restitution, community service and house arrest. Although these programs are not entirely new, the call of late has been for the intensification and increase in their use. It is to the literature dealing with these alternatives that we now turn.

One rationale that has been advanced in favor of alternatives to incarceration is the ability to reintegrate the ex-offender into the society and perhaps rehabilitate him (Galaway 1977). Galaway put forth this argument

asserting that crime results from the estrangement of the individual from meaningful participation in society. While imprisonment exacerbates that estrangement, restitution permits the offender to undo the damage of his crime as he becomes integrated into the society through constructive actions.

Restitution and community service traditionally have been used by criminal courts for minor offenders, but in recent years attempts have been made to expand their application to those committing more serious crimes. A survey by Chesney (1977) in Minnesota, based on inspection of a sample of court records, revealed that restitution was included in 19 percent of adult and 18 percent of juvenile probation orders. Supporting this finding is the study by the Institute of Policy Analysis (1977) in which juvenile court officials were asked to estimate their use of restitution. This study revealed that 86 percent of all juvenile courts were reported to use some type of restitution.

Chesney, Hudson and McLagen (1978) studied the nationwide trend of restitution programs and found only 40 formal programs, while Harris (1979) found more than fifty community service programs in California alone and Hudson and Galaway (1979) reported eighty two adult programs emphasizing restitution and community service.

There have been attempts by some researchers to determine the effectiveness of alternatives in reducing imprisonment. These studies have uncovered some irregularities in implementing these programs that could account for the apparent weakness in their effectiveness. For instance, Martin (1980) found that restitution has generally been employed for young, white male property offenders with few prior convictions. Chesney (1977) found that 96 percent of persons in Minnesota ordered to make restitution had been property offenders. In the Harris (1979) and National Council of Crime and Delinquency (1980) studies, restitution and community service programs in California were reported to be limited to misdemeanants and minor property offenders. Harris and Martin also reported the use of sentencing alternatives for traffic offenses and in lieu of fines.

The British Home Office Research Unit (1975) attempted to develop better estimates of the extent to which community service replaced incarceration. Four different methods were used to gather the data, yielding mixed results. The first, second and fourth methods yielded estimates that incarceration had been avoided in 45 to 50 percent of all cases. The third method yielded different results. Of the 102 cases in which a judge had ordered a reconsideration of the offender's suitability for community service, 18 (18 percent) were sentenced to imprisonment and 84 (82 percent) received noncustodial sanctions. The conclusion here is that most offenders would not have been incarcerated in any case. Another example of research measuring the extent to which restitution orders replace incarceration is the National Evaluation of Juvenile Restitution by the Institute of Policy Analysis (1979). In determining whether restitution projects served youths at risk of incarceration, the researchers assumed that appropriate clients were offenders with extensive criminal histories or who had committed serious offenses. Using five different definitions of appropriateness, the institute concluded that 9 to 69 percent of all referrals were not appropriate candidates; that is, they were not likely to have been incarcerated in any case.

An interesting study on alternatives to incarceration which lends considerable credence to the idea was done by Barrantes (1980). This work is significant because of its stance on the effectiveness of alternative programs, with respect to Latin American countries.

Barrantes indicates that Latin America, prior to present prison crowding crises, had alternatives. However, the use of these alternatives was not vigorously pursued until recent times. He appropriately notes that these alternatives have been successful when implemented as a spelled out deliberate policy of the ruling administration. Nevertheless, when they are implemented as supplementary to incarceration, they are met with very limited success. This study, more or less, fathoms the reasons for the unfavorable findings of some of the earlier works in this regard.

In conclusion, available data on alternatives to incarceration programs indicate that although these programs traditionally have been used as sanctions for minor offenses, there have been attempts being made lately to expand the program to include some serious offenses. However, studies equally show that results of efforts on using these programs to reduce crowding in correctional facilities have not been encouraging in some cases, but encouraging in others. The mixed results have been due to lack of enthusiasm and irregularities apparent in the implementation of these programs. On the other hand, when alternative programs are embarked upon with much interest and vigor, evidence shows that they can be very effective.

4.0 HYPOTHESES

Sufficient data are available to allow us to make definitive statements about crowding and other related variables, statements which can later be proven or disproved. Consequently, we have defined crowding in correctional facilities in terms of available space/inmate ratio. We have defined it in terms of spatial density, since this seems to be the definition that more easily quantifies the problem and therefore renders it more measureable. We have seen crowding as a problem because as shown in the foregoing literature, it can lead to several consequences and ultimately to inmate riots in correctional facilites. As was explained in the opening section of this work, it is the

latter reason that has brought the problem to public awareness. This awareness has driven policy makers in search of causes and solutions.

4.1 Hypothesis One
Alternatives to incarceration programs are more effective in reducing crowding in correctional facilities than capital construction programs.

Perhaps capital construction program in corrections is one of those variables that have been greatly affected by crowding and the consequent search for solutions by policy makers (Petersilia and Greenwood 1978; Harriman and Straussman 1983; Nardulli 1983; Finn 1984). Policy makers in a bid to resolve the crowding problem, often resort to increasing the capacity of the prison system as a viable option. Providing more prison space, of course, engenders increasing correctional capital budget and expenditures. But policy makers may embrace this alternative due to a combination of several reasons. They may do so in the belief that it constitutes the best solution to the crowding problem; or because they misperceive public attitude regarding penal justice (Gottfredson and Taylor 1984; Flanagan and McGarre11 1986); or because of economic incentives (Nardulli 1983); or because of judicial decisions (Petersilia and Greenwood 1978; Nardulli 1983; Harriman and Straussman 1983; Finn 1984).

Unfortunately, however, such policy courses of action do negate the real intent of such programs, sometimes leading to more crowding. In short, policies advocating the use of capital construction programs for the purpose of crowding reduction in correctional institutions have a tendency to be ineffective.

However, if capital construction programs are ineffective in reducing crowding, other alternatives may be effective in doing so. As indicated in the foregoing, alternatives to incarceration programs have been shown to be effective if they are seriously implemented. Alternatives to incarceration are not only effective but they are also less expensive than capital construction programs. Expenditures for such programs in most cases are limited to operational costs, especially costs that accrue from personal services. Programs such as probation, community service, restitution and house arrest require that the offender serve his/her sentence while living at home. Where the punishment is in the form of restitution or community service, the offender actually contributes either financially or in kind to the society (Nunn and Armstrong 1983; Cory and Gettinger 1984; McGahey 1986), thereby making the program a less costly approach to resolving the crowding problem.

Some research (British Home Office Research Unit 1975; Institute of Policy Analysis 1979) have shown that alternatives to incarceration programs are effective in keeping offenders out of prison, indicating that they are more effective than incarceration programs in rehabilitating offenders. Based on this argument we hypothesize that alternatives to incarceration programs are more effective in reducing crowding in correctional facilities than capital construction programs.
Expressed symbolically, we write

$$C = f(E_1, E_2); \quad \frac{\partial c}{\partial E_1} > \frac{\partial c}{\partial E_2}$$

Where C is crowding, E_1 is capital construction expenditures, and E_2 is alternatives to incarceration expenditures. By this argument we mean that crowding in correctional facilities is necessarily a function of correctional capital construction expenditures and alternatives to incarceration expenditures. This means that an increase in the former variable engenders an increase and a decrease in the latter two variables, respectively.

4.2 Hypothesis Two
Crime rates are positive determinants of crowding in correctional facilities.
Related to recidivism as a determinant of crowding is crime. It seems that the relationship between crime and crowding should be an obvious one, where a negative change in the former variable would generate a negative change in the latter variable. Although some studies (Petersilia and Greenwood 1978; Nardulli 1983) have shown that the relationship is not always positive, several studies (Sagi and Wellford 1968; President's Commission 1968; Ferdinand 1970; Wellford 1973; Blumstein and Nagin 1975; Fox 1976) have indicated that prison population increases with increase in crime rates. It is on this basis that we hypothesize that crime rates are explicit positive determinants of crowding in correctional facilities.
Expressed symbolically, we write

$$C = f(R); \quad \frac{\partial c}{\partial R} > 0$$

Where C is crowding and R is crime rates.

5.0 RESEARCH METHODOLOGY
The analytic technique applied for this research uses a modeling approach for estimating the effects of the specified explanatory variables on the dependent variable of crowding.

There are two primary objectives for identifying these variables for measurement. First, we want to develop a systematic approach for estimating the effects of correctional policies on crowding. Secondly, we want to measure the effects of other relevant variables on crowding. For this purpose, an econometric model was developed in order to put empirical content to the *a priori* assumptions outlined in the hypotheses section. As part of this empirical effort, appropriate time-series data relevant to all the variables have been gathered. Our sample of observation is from 1965 to 1985 (a period of 21 years). Two types of computer software packages, namely, Soritec and Shazam were used for solving the model.

5.1 The Variables
The equations of the model consist of two kinds of variables:
i. Dependent variables and
ii. Explanatory variables.
The dependent variables include crowding rates. These are stochastic variables. The explanatory variables include capital construction expenditures, alternatives to incarceration expenditures, crime rates, non-white inmates, non-high school graduates, age under-30 years, and age under-25 years. These variables are non-stochastic. Measuring each of these variables is crucial for understanding the nature of the data used for estimating the model.

As will be shown later, an attempt to estimate the model using all of the above variables resulted in multi-collinearity. Consequently, the number of the explanatory variables for the crowding equation, for both Nigeria and New York, was limited only to capital construction expenditures, alternatives to incarceration expenditures and crime rates. The model was then reformulated and re-estimated employing these variables. A discussion of the various forms of the model will follow later.

5.1.1 Crowding
There are two methods of determining crowding in correctional facilities. These two derive from two sets of psychological theories of crowding that were reviewed in the literature section. The first of these theories, density intensity theories, define crowding as the situation in which the individual is exposed to high density, or in which he is "being crowded". It is argued here that being crowded has an enhancing effect on feelings and behavior that is independent of its effective impact or stressfulness.

The second set of theories, felt discrepancy theories, define crowding as an experience perceived by the individual, a felt discrepancy between the person's actual and desired environments. This discrepancy can be experienced as restricted movement, scarce resources, security threats, lack of availability of meaningful roles, or infringement on privacy.

It is much easier to measure crowding based on the former definition since tangible criteria can be developed for doing so. The American Correctional Association publishes elaborate standards recommended for providing living space for inmates in correctional institutions. Depending on the type of facility, a specified area of livable space, including recreational facilities and toilet facilities are recommended. Consequently, standards differ between minimum security facilities and general confinement facilities. Generally, 50 square feet per inmate is required for work release facilities and 60 square feet per inmate is required for general confinement facilities. For our purposes, crowding rate is determined as the proportion of the difference of current inmate population on design capacity.

In order to determine crowding rate, the facility housing design capacity (determined using ACA standards) is subtracted from current inmate population of the facility and the resulting difference is divided by design capacity. This result is the crowding rate. In this study, however, the unit of analysis is not individual facilities as such, but the cumulative of facilities existing in each system. Thus, in this study, housing design capacity refers to the sum of capacity of all the correctional facilities in Nigeria or New York. Similarly, inmate population refers to total inmate population for the entire correctional system of either Nigeria or New York.

5.1.2 Capital Construction Expenditures
Data on capital construction programs are taken from budgetary publications of New York and Nigeria. The expenditure amounts were adjusted using Consumer Price Index in order to account for inflation. The base year used is 1967. Currency units used are the U.S. dollar for New York and the naira for Nigeria. Since data on expenditures are kept on fiscal year basis, attempt has been made to pro-rate these values for the purpose of obtaining the expenditures for the calendar year.

Data on capital expenditures include funds appropriated and spent by the correctional systems on capital projects. These projects include construction activity initiated either for the purpose of extending the useful life of an existing facility or for the purpose of providing a completely new facility. Ordinary every day maintenance expenditures or minor rehabilitation projects are excluded.

5.1.3 Alternatives to Incarceration Expenditures
Like capital expenditures these expenditures are based on calendar year and constant values. The currency units are equally the dollar for New York and the naira for Nigeria. We define alternatives to incarceration as

punishment other than incarceration imposed by the courts on a convict. The data used here include expenditures on probation, restitution, community service and house arrest. Most of the available data show that the greater proportion of this amount was spent on probation. This is because this option is more traditional and older than the other alternatives.

5.1.4 Crime Rates

Data on crime rates are published by the U.S. Department of Justice, Federal Bureau of Investigation (FBI). These data as they apply to New York will be utilized. The Nigeria Police Force also publishes similar data. Data on crime rates are based on selected offenses known to the police and include murder and manslaughter, rape, assault, robbery, burglary, larceny, and auto theft. Crime rates are usually measured in terms of these offenses committed per 100,000 population. We use crime rates to measure the hypothesis that rising crime rates increase incarceration which leads to crowding.

5.2 Data Collection

In any research effort, the data collection process can quickly assume either of two approaches, namely, using data emanating from either a primary or a secondary source. The process can also involve a combination of both of these two approaches. Usually, where data are already available, the need for going to a primary source for information is eliminated. In this study, both types of data are utilized.

Moreover, it appears that there are two kinds of data that become necessary for an empirical work of this nature. They are:
1. Soft data and,
2. Hard data

While the soft data consist of the corpus of narrative and theoretical information necessary for formulating the basic ideas, the hard data include those real numbers that make up the major ingredient for the empirical analysis. The hard data provide the evidential input necessary for buttressing the assertions in the soft data. In short, both kinds of information complement each other.

Since the subject of this thesis deals, essentially, with construction as a tool of public policy, all of the data sources are governmental agencies. To this extent, the data on crowding and inmate characteristics for Nigeria were obtained from the Nigerian Prisons Service and for New York they were obtained from the New York State Department of Correctional Services and the Parole Division. All of the data on correctional expenditures for Nigeria were obtained from the Nigeria's Ministry of Finance while those for New York State were obtained from the New York State Division of Audit and Control.

Our sources for crime rates were the Nigerian Police Force and the Federal Bureau of Investigation (FBI) for Nigeria and New York, respectively.

As indicated earlier, our sample of observation consists of time series data for 21 years, beginning from 1965 to 1985.

5.3 Specification and Estimation of the Model

On the whole, the above results, although indicating high coefficients of determination, R^2, reveal that a large number of the slope coefficients are not individually statistically significant and a few have the wrong sign relative to a priori assumptions. This nature of result which exhibits high R^2 and low *t*-ratios is symptomatic of the problem of multi-collinearity. This is not unusual with time series data. This tendency, unfortunately, suggests that the present formulation of the model may not be empirically testable.

Resolving the problem would be too ambitious for the purpose of this study. Doing so would require an almost infinite set of data. Since there is no easy way of dealing with collinearity, we shall disregard this formulation of the model and the resulting estimates. What follows is a reformulation of the model, in the order of transcendental logarithm, or Translog.

5.3.1. SPECIFICATION AND ESTIMATION OF THE TRANSLOG MODEL

In view of the co-linearity problems encountered in the previous form of the model, it was difficult to distinguish the real effects of each of the explanatory variables on the dependent variables. As a result, it was decided to identify some of the more relevant variables and to do a more in-depth analysis on them. This was done using stepwise backward regression. Those variables that could be entered in the regression equation were identified for use in a transcendental logarithm (Translog) equation. Limiting the number of explanatory variables to no more than three allows one the capacity to conduct a more in-depth analysis of the problems. Employing Translog for measuring these variables provides one the mechanism for rendering a much more intensive analysis than would ordinarily be possible with a multiple regression equation.

5.3.2 Translog Functions

The objective of reformulating the model in the Translog form is to focus our analysis on a few relevant variables at a relatively high degree of complexity. To this end, the Translog form has the superior attribute of providing one the facility of determining the different order effects that may be apparent in a statistical

relationship involving a few stochastic dependent and non-stochastic explanatory variables. Some of these effects are invisible while others are visible. The visible or simple effects consist of the total effects. The invisible effects consist of the first order or short run effects, the second order or long run effects and cross or interactional effects. Unlike the visible effects, the invisible effects are partial effects.

The first order effects are the effects that occur in the short run. The second order effects are the effects that hold in the long run. They are marginal. The cross or interactional effects represent the effects that hold when the variables interact with each other. This effect could hold either in the long run or short run. The total effects are the sum or aggregate of all the effects and represent the overall effects in both the short and long run. This unique attribute of the Translog lacks in the multiple regression model.

The following form of the Translog model shall now hold for this study:

$$LogC = c_0 + \alpha_1 logE_1 + \alpha_2 logE_2 + \alpha_4 logR + \frac{1}{2}\alpha_{11}(logE_1)^2 + \frac{1}{2}\alpha_{22}(logE_1)^2 + \frac{1}{2}\alpha_{44}(LogR)^2 + \alpha_{12}logE_1logE_2 + \alpha_{14}logE_1logR + \alpha_{24}logE_2logR$$

....(6.1)

The final form of the model shall then consist of equation 6.1. The following section is a discussion of these estimates.

5.3.3 Estimation of the Translog Form of the Model

The explanatory variables included in the crowding equation of the Translog function are capital construction expenditures, alternatives to incarceration expenditures and crime rates. These variables were identified using the method of stepwise backward regression, where all the explanatory variables were included in one multiple regression and then rejected one at a time. Following is a discussion of the resulting estimates.

5.3.4 Estimation of the Translog Crowding Functions

Tables 5.1 and 5.2 show the results of estimating the Translog crowding equations for both New York and Nigeria, respectively.

TABLE 5.1
OLS ESTIMATES OF CROWDING ELASTICITIES FOR NEW YORK (DERIVED FROM TRANSLOG FUNCTIONS)
CROWDING ELASTICITY

VARIABLES			COEFFICIENT	
	1st order effects	2nd order effects	Cross effects	Total effects
E_1	152.35	82.02	-232.06	2.31
E_2	155.75	-16.71	-137.46	1.59
R	-331.49	390.62	-54.42	4.71

E_1 = capital Const. Exp. E_2 Alt. to incarceration. Exp:.
R = crime rates

TABLE 5.2
OLS ESTIMATES OF CROWDING ELASTICITIES FOR NIGERIA (DERIVED FROM TRANSLOG FUNCTIONS)
CROWDING ELASTICITY

VARIABLES			COEFFICIENT	
	1st order effects	2nd order effects	Cross effects	Total effects
E_1	24.19	15.38	-37.12	2.46
E_2	-47.27	-0.46	48.81	1.09
R	166.28	-198.16	32.66	0.78

5.3.4.1 Estimates of Crowding Elasticity for New York

A review of the data illustrated in Table 5.1 shows that the results are reasonable. Our primary concern is with the total effects which constitute the test for the a priori expectations. This effect is especially important because it is a measure of cumulative or aggregate dependence. We are equally concerned with the first order, second order and interactional effects. These, unlike the total effects, are partial effects. The first order effects, as noted above, are the short run effects. The second order effects are long run effects. They are marginal. The cross effects are due to interaction of more than one explanatory variables.

A look at the column for total effects of table 5.1 reveals that these numbers are relatively small in magnitude and positive in sign. This result is reasonable and as far as E_1 and E_2 are concerned, it is consistent with a priori expectations and acceptable. The total effect of R is also positive and consistent with a priori expectation.

With respect to first order effects, the numbers are relatively large. The first order elasticity for capital construction expenditures is not only large but also positive. The first order elasticity for alternatives to incarceration expenditures is equally large and positive. In fact, this elasticity is almost equal in size to the first

order elasticity for capital construction expenditures. On the other hand, although the first order elasticity for crime rates is very large, it is negative in sign.

With regard to second order elasticity, the magnitude of the coefficients is still large for E_1 and R. These two elasticity are also positive. The second order elasticity for E_2, on the other hand, is not only relatively small, but also negative.

A review of the column for cross effects reveals an equally interesting pattern. The effects of the three variables are all negative and relatively large in magnitude. The elasticity for capital construction expenditures, E_1, is very large and negative. The elasticity for alternatives to incarceration expenditures, E_2, is similarly large and negative. Although not quite as large as those of E_1 and E_2, the interactional effect elasticity for crime rates, R, is large and similarly negative.

Perhaps, in order to better understand these results, it may be helpful to compare them in terms of sign and magnitude. Let us start by examining the first order effects and the total effects. We shall then compare the first order and second order effects.

The result clearly shows that the first order effects are very large relative to the total effects. Expressed more precisely, it is observable that the first order effect for E_1 is about seventy-six times the total effect. The first order effect for E_2 is nearly one hundred times the total effect, while the first order effect for R is over seventy times the total effect.

With respect to sign of the elasticity, we observe that while the sign of the first order and total effects of E_1 and E_2 is the same (it is positive), the sign of the first order effect of R differs from that of its total effect. The first order effect of R is negative, while the total effect is positive.

It appears from this result that the magnitude and sign of the total effects tend to depend on the size and sign of the second order and interactional effects. Hence, the seeming tendency for the total effect to be considerably reduced in magnitude relative to first order effect. This phenomenon can also account for the change in sign of R from negative at first order effect to positive at total effect.

Comparing the first order and second order effects shows that with respect to E_1 and E_2, the first order effects are considerably large. While the sign of the first order and second order effects for E_1 is the same (positive), the sign for first order and second order effects for E_2 differ. While the former is positive, the latter takes on a negative value. The result elasticity for R, on the other hand, differs. With respect to R, while the first order effect is negative, the second order effect is positive. However, both effects (first order and second order) are comparatively large, although the second order effect is considerably greater than the first order effect.

A review of the results of the cross or interactional effects reveals an equally interesting pattern. It can be observed that these effects, similar to the first order effects, are considerably large in magnitude. The sign, however, is consistently negative for all the variables under study.

From this result, it can be observed that the total or visible effects are much more stable than the partial or invisible effects. Unlike the total effects, the partial effects are more sensitive.

Do these results mean anything at all and can they be considered reasonable for this study? To answer this question, one must submit that there is no doubt of the results ability to highlight, for the first time, new information about the dependence of crowding on capital expenditures, alternatives to incarceration and crime. The results are reasonable and do offer some explanation as to the intrinsic meaning of this dependence.

Let us examine this result more thoroughly. We start again with the total effects. A priori, the expectation with respect to capital construction expenditures, E_1, and alternatives to incarceration expenditures, E_2, was that E_1 would be greater than E_2. This result is consistent with this expectation and is supported by previous research findings (British Home Office Research Unit 1975; The Institute of Policy Analysis 1979; Abt Associates 1980; Nardulli 1983), which have tried to show that correctional capital construction programs have a tendency to be positively deterministic of crowding and that alternatives to incarceration programs are more effective in reducing crowding in correctional facilities than capital construction programs. The study by Abt Associates suggested that as more prison space is made available through increased correctional capital expenditures, rates of incarceration increase, leading to more crowding. Abt Associates suggested that this trend is made possible by the relative inclination of judges to impose sentences of incarceration with greater frequency when spaces are available than when they are scarce. Nardulli's study also found this positive effect to be true, even though the data set used for each study was different. With regard to alternatives to incarceration programs, the studies by the British Home Office and The Institute of Policy Analysis indicated high success rates for these programs.

This result is especially noteworthy, because of the aggregate nature of the effects. Unlike the first order effects, the total effects could hold at any time period. This quality, lends a very strong support to our assertions about the effects of these two variables. Simply stated, it implies that a correctional policy that advocates increasing correctional capital expenditures without serious consideration for alternatives to incarceration programs may not make for good policy. Rather than reduce crowding in correctional facilities, such a policy may actually increase it.

With respect to first order effects, it is evident that the crowding elasticity is very large as compared to the

total effects. E_l is positive but not greater than E_2. This seems to suggest that the first order effects of capital expenditures and alternatives to incarceration expenditures on crowding are positive. This also suggests that in the short run, capital construction expenditures may be more effective in reducing crowding than alternatives to incarceration expenditures. However, in the long run, this effect clearly changes, with the elasticity for E_l becoming far greater than the elasticity for E_2. This is really interesting and the difference in the magnitude of these two elasticities vividly portrays the difference between the first order or short run effects and the second order or long run effects. It appears that the long run effects, in this instance, clearly represent the stronger effect. In short, while in the short run, capital construction expenditures may be more effective than alternatives to incarceration expenditures, in the long run, alternatives to incarceration expenditures are much more effective than capital construction expenditures. Since second order effects are marginal effects, this result could mean that even though alternatives to incarceration expenditures may be less effective at the onset (short run), as crowding reaches optimum levels, alternatives to incarceration expenditures become effective on any additional or incremental units of crowding.

This effect changes when these variables interact with each other or other variables. The result shows that the interactional effects of capital construction expenditures and alternatives to incarceration expenditures on crowding are both negative, indicating that both variables could decrease crowding, however E_1 would be more effective than E_2. Although this result may be possible, the result of the total effect does diminish its importance. This is because, as indicated earlier, while the first order, second order and interactional effects are partial effects, total effects are cumulative effects and are much more stable. The fact that the total effects are stable leads one to accept them as the more valid result. The partial effects show the latent source of these effects.

With respect to crime rates, R, the total effects are similarly small. The sign is positive and consistent with a priori expectations and previous research. What this means is that increasing crime rates do have a tendency to increase crowding. However, the first order effect is very large and negative, meaning that in the short run, increasing crime rates may not cause crowding to increase. The second order effect differs markedly from the first order effect, it is positive. In terms of magnitude, the elasticity is very large, on the same scale as the first order effect. This means that in the long run, increasing crime rate could result in increases in crowding. It could also mean that although crime rates on the onset do not necessarily lead to crowding, as crowding reaches optimum levels, any additional input of crime rates would result in crowding. When interacting with other variables, however, the effect is negative, suggesting again that increasing crime rate may not necessarily result in increasing crowding in correctional facilities.

To summarize, consistent with a priori expectations, the results of estimates of crowding elasticity for New York suggest that at total effects, alternatives to incarceration expenditures tend to be more effective in reducing crowding in correctional facilities than capital construction expenditures. The results, however, indicate that the partial effects, except for the second order effects, differ slightly. The result also shows that consistent with a priori expectation, the total effects of crime rates on crowding are positive; indicating that increases in crime rates could result in increases in crowding in correctional facilities. However, the partial effects, except for the second order or long run effects, are different.

Although the first order, second order and interactional effects of these explanatory variables constitute important indicators of the deterministic relationship that is the subject of measurement in this study, their nature as measures of partial effects renders them relatively inferior to the total effects, which constitute the measures of aggregate or cumulative effects. As can be observed from these results, the total effects are stable, suggesting that these variables can constitute universal determinants of crowding. The partial effects are more sensitive, and only provide one the basis for understanding the underlying source of the total effects.

5.3.4.2 Estimates of Crowding Elasticity for Nigeria

Examining the results of the total effects of table 5.2 indicates that these are very small in magnitude and positive. Comparing capital construction expenditures, E_l, with alternatives to incarceration expenditures, E_2, reveals that the former is significantly greater than the latter. This is a very reasonable result and is consistent with a priori expectation. Crime rates, R, are equally very small and positive. This is also consistent with a priori expectation.

If we compare total effects with first order effects as we did for New York, we find that the estimates of crowding elasticity at first order effects are considerably larger in magnitude than those of the total effects. Although the figures are much larger at first order effects, the results are comparable to those of total effects. For instance, E_l is still greater than E_2 and R is still positive.

With respect to second order effects, E_l is still greater than E_2; however, R takes on negative value. The interactional effects are also relatively large. However, E_2 is now much greater than E_l. The interactional effect of R, although significantly reduced in size relative to second order effects, is now positive.

To further appreciate these results, let us compare the total effects with the first order effects relative to size. One observes that with respect to E_l, the first order effect is nearly ten times the total effect. Regarding E_2, the first order effect is almost forty four times the total effect and with respect to R, the first order effect is over two

hundred times the total effect.

Do these results mean anything at all? Are they reasonable? The evidence seems to suggest that they are not only meaningful but also very reasonable.

First, let us examine the meaning of the estimates of the total effects. It can be observed that E_1 is greater than E_2 indicating that alternatives to incarceration expenditures are more effective in reducing crowding in correctional facilities than capital construction expenditures. This is a very strong and important result and is consistent with a priori expectation. The importance of this result is underscored by the fact that the total effect, as indicated above, consists in cumulative effect, representing the aggregates of short run, long run and interactive effects. This result, as noted in the foregoing analysis for New York, is supported by previous research findings (British Home Office Research Unit 1975; Institute of Policy Analysis 1979; Abt Associates 1980; Nardulli 1983), which have tried to show that capital construction programs are less effective in reducing crowding than alternatives to incarceration programs.

As regards the crowding elasticity with respect to crime rates, one observes that the total effect, although significantly small, is positive. This result suggests that crowding increases with rising crime rates. This is consistent with a priori expectation and previous research (Sagi and Wellford 1968; Ferdinand 1970; Wellford 1973; Blumstein and Nagin 1975; Fox 1976).

Comparing first order effects for capital construction expenditures and alternatives to incarceration expenditures shows some consistency with the results of the total effects; the former variable is greater than the latter. This result indicates that in the short run, alternatives to incarceration expenditures are more effective in reducing crowding in correctional facilities than capital construction expenditures. This result is also evident in the second order effects, showing that in the long run, alternatives to incarceration expenditures are equally more effective in reducing crowding in correctional facilities than capital construction expenditures. This result could also mean that alternatives to incarceration expenditures are not only effective at the onset of crowding, but also at the marginal level. The result is remarkably plausible and constitutes strong support for the theoretical expectations of the total effects. However, the result shows that the interactional effects of capital construction expenditures and alternatives to incarceration expenditures are of the nature that the former variable could be more effective in reducing crowding than the latter variable.

With respect to crime rates, the result shows that the first order effects on crowding are positive. This is consistent with the total effects. It indicates that in the short run, rising crime rates could result in increases in crowding in correctional facilities. However, the second order effects are negative, indicating that in the long run, rising crime rates may not necessarily result in increases in crowding in correctional facilities. In other words, after attaining optimum levels of crowding, crime rates may not contribute to additional units of crowding. Nonetheless, the interactional effects of crime rates on crowding are positive, indicating that when crime rates interact with other variables, they could lead to increases in crowding in correctional facilities.

In conclusion, consistent with a priori expectations and previous research, results of estimates of crowding elasticity for Nigeria indicate that the total effects of capital construction expenditures and alternatives to incarceration expenditures are such that the latter variable is more effective in reducing crowding in correctional facilities than the former variable. This result is also the case in both short and long run. However, the interactional effects of these two variables differ from this result.

With regard to crime rates, the results indicate that consistent with a priori expectations and previous research, the total effects of this variable on crowding in correctional facilities are positive, suggesting that increasing crime rates could lead to increases in crowding. This result is the same in the short run and at interactional effects. However, the second order effects are different from this result.

As noted in the case of New York, we again state that due to their partial nature, the first order, second order and interactional effects could be considered relatively inferior to the total effects which constitute aggregate or cumulative effects. However, all of the effects should be accepted as important and valid measurement of the deterministic relationship existing in the model. This observation is plausible, considering that each effect deals with a particular aspect of this relationship. Each effect is an important contribution of the Translog functions and the partial effects help reveal the underlying source of the total effects.

5.3.4.3 A Comparison of the Crowding Results: New York vs. Nigeria

Perhaps, it will be helpful at this juncture to further analyze these results at some systemic comparative level. It will, therefore, be instructive for the purpose of this study, to compare the estimates of the crowding elasticity for New York with those of Nigeria. This is being done, in order to further elucidate the meaning of these results and may be, to elicit the universal nature of these variables. What follows then is a comparative analysis of the results illustrated in tables 5.1 and 5.2.

It appears that the total effects of the three explanatory variables, E_1, E_2, and R, on crowding are quite comparable. All of the coefficients at total effects are positive. In terms of magnitude, E_1 and E_2 for both systems are almost the same, but the value for crime rates, R, is comparatively much greater for New York than for Nigeria.

What does this suggest? It suggests that the aggregate effects of capital construction expenditures and alternatives to incarceration expenditures are such that the latter is more effective than the former in reducing crowding in correctional facilities for both New York and Nigeria. This shows that as far as these two variables are concerned, our a priori expectations are correct, regardless of whether the system under consideration is New York or Nigeria. A priori, E_1 was expected to be greater than E_2.

Although the estimates of the elasticity for crime rates are positive for both systems, the elasticity for New York is far greater than that for Nigeria. This suggests that although crime rates may result in increases in crowding for both New York and Nigeria, the incidence is much greater for the former than the latter. In short, crime rates as a determinant of crowding, is a more relevant variable for New York than for Nigeria.

With regard to first order effects, we observe that the values are much larger for New York than for Nigeria. We notice, for instance, that the first order effects for New York are more than six times those of Nigeria. For E_2, they are over three times those of Nigeria. The first order effects of R for New York are nearly two times those of Nigeria. We also notice that the signs for E_2 and R for New York are the opposites of those of Nigeria. This result could be suggestive of the fact that whereas in New York, capital construction programs could be more effective than alternatives to incarceration programs in reducing crowding in the short run, in Nigeria the reverse is the case. The result also suggests that whereas increasing crime rates in New York in the short run may not lead to increases in crowding, doing so in Nigeria in the short run may lead to crowding.

As regards the second order effects, we also notice that the values of the elasticity are similarly larger for New York than for Nigeria. The second order elasticity for E_1 for New York is over five times that of Nigeria. The elasticity for E_2 for New York is over thirty six times that of Nigeria, and the elasticity for R for New York is nearly two times that of Nigeria (a similar result as in first order effects). We also observe that similar to first order effects, E_1 is positive for both systems. E_2 is negative for both systems, but R is positive for New York and negative for Nigeria. This result seems to suggest that in the long run or at the marginal level, alternatives to incarceration expenditures is more effective for reducing crowding than capital construction expenditures, irrespective of whether the system concerned is New York or Nigeria. However, whereas increasing crime rates in the long run in New York may result in increases in crowding, doing so in Nigeria may have the reverse effect.

With respect to cross or interactional effects, we observe that similar to first order and second order effects, the elasticity for New York are significantly greater than those of Nigeria. We also observe that while the parameter signs for all three variables for New York are negative, for Nigeria, the parameter signs for E_2 and R are positive. E_1, however, is negative. Interestingly, this difference in sign does not diminish the basic fundamentals of our argument with regard to E_1 and E_2. We observe at once that irrespective of the system concerned, when interacting with other variables, E_2 seems to be greater than E_1. However, whereas increasing crime rates, R, in New York, at the interactional level, may not lead to crowding, doing so in Nigeria may lead to crowding.

A general overview of these results does portray some instructive information. For instance, it is instructive to observe that in spite of the differences in magnitude and sign of the partial effects of both systems, the total effects are remarkably similar.

This may suggest that although the first order, second order and interactional effects of E_1, E_2, and R may not be exactly the same, the cumulative or aggregate effects are strongly similar. In short, we can postulate with a considerable degree of certainty, that cumulatively, irrespective of whether the correctional system concerned is New York or Nigeria, alternatives to incarceration expenditures are more effective in reducing crowding than capital construction expenditures. We can equally assert with some certainty, that cumulatively, increasing crime rates could lead to crowding, regardless of whether the correctional system concerned is New York or Nigeria.

6.0 CONCLUSIONS AND IMPLICATIONS

One of the objectives of this study has been to develop an econometric model for measuring crowding. This study is distinct from previous work on the subject because, for the first time, a unique model specifically targeted on this variable has been developed. This model is called, *the Translog Crowding Functions*. The model has provided one the capacity to obtain some reasonable estimates of the effects of certain specified variables on crowding. One was able to do this for both New York and Nigeria.

In developing the model, one sought to establish that policies advocating capital construction programs as a solution to crowding in correctional facilities may not be effective policies. One sought to establish that governmental policies towards alternatives to incarceration programs need to be re-examined, to encourage the punishment of certain types of non-violent crimes with alternatives. A deliberate policy of alternatives to incarceration will have the good effect of opening up prison space needed for incarcerating the more violent offenders. One further wanted to compare and contrast one's findings for New York and Nigeria in order to identify instructive lessons.

One also reviewed certain literature pertaining to a myriad of variables thought to be relevant to crowding. Through this literature, one was able to define crowding in measurable terms. It was seen from this literature the

nature and seriousness of crowding and therefore a valid rationale for studying it as a problem was established. The literature also helped us fathom the relationship of other variables with crowding. These variables include capital construction expenditures, alternatives to incarceration expenditures, and crime rates.

Using the literature, one was able to establish some hypotheses based on these variables. Unfortunately, the initial model formulations in the order of multiple regression functions did not allow one to test all the hypotheses. We experienced a multi-colinearity problem. But there is no easy way of resolving colinearity problem. We therefore, reformulated the model in the order of Translog functions, limiting the explanatory variables to just a few relevant variables. The results based on the Translog model were stable, reasonable and acceptable. From these results the following conclusions can be inferred.

6.1 Conclusions from Translog Crowding Estimates

Several conclusions can be derived from the estimates of crowding elasticity for both New York and Nigeria. First, judging from the results of the total effects, one can state unequivocally that consistent with our hypothesis, alternatives to incarceration programs can be more effective in reducing crowding in correctional facilities than capital construction programs. The evidence is very clear that the total effects of E_1 are greater than E_2 both in New York and Nigeria. This has been consistent with a priori expectation and previous research.

Secondly, one can also conclude from the results that consistent with our hypothesis, crime rates do have aggregate positive effects on crowding. In other words, rising crime rates would increase crowding in correctional facilities in both New York and Nigeria.

REFERENCES

1. Allison, John P. "Economic Factors and the Rate of Crime", *Land Economics.* 48:2 (May 1972):193-196
2. Altman, I. "Privacy: A Conceptual Analysis". In D. Carson, Ed.,*Man-Environment Interactions: Evaluations and Applications(Pt. 2).* Stroudsbourg, Pa: Dowden, Hutchinson, and Ross, 1974.
3. Altman, I. *The Environment and Social Behavior: Privacy, Personal Space, Territory and Crowding.* Monterey, Ca: Brooks/Cole,1975.
4. Altman, I. and J. Wohlwill (Eds.). *Human Behavior and Environment: Advances in Theory and Research,* (vol. 1). New York: Plenum,1976.
5. Armstrong, William L. "Prudent Use of Prison Space: The Sentencing Improvement Act" *Journal of Legislation.* 11:237-48, Summer 1984.
6. Austin, James and Barry Kisbert, "The Unmet Promise of Alternatives to Incarceration" *Crime and Delinquency.* 28: 374-409, July 1982.
7. Baron, R. and J. Rodin. "Personal Control and Crowding Stress" In A.
8. Baum, J. Singer and S. Valins, Eds. *Advances in Environmental Psychology.* (Vol. 1). Hillsdale, NJ: Erlbaum, 1978.
9. Baum, A. and Y. Epstein, Eds. *Human Response to Crowding.* Hillsdale, NJ: Erlbaum, 1978.
10. Baum, A., R.E.Harpin, and S. Valins "The Role of Group Phenomenon in the Experience of Crowding", *Environment and Behavior.* 7:185-199, 1975.
11. Baum, A., M. Reiss and J. O'Hara "Architectural Variants of Reaction to Spatial Invasion", *Environment and Behavior.* 6:91-100,1974.
12. Bickman, L., A. Teger, T. Gabriele, C. McLaughlin, M. Berger and E.Sunaday "Dormitory Density and Helping Behavior" *Environment and Behavior.* 5:465-490, 1973.
13. Blumstein, Alfred, Jacqueline Cohen and Daniel Nagin, eds. Deterrence and Incapacitation; Estimating *Effects of Criminal* Sanctions on *Crime Rates.* Washington, D.C.: National Academy of Sciences, 1978.
14. Blumstein, Alfred, Jacqueline Cohen and Harold D. Miller,"Demographically Disaggregated Projections of Prison Populations", Journal *of Criminal Justice.* 8:1-26, 1980.
15. Blumstein, A. and D. Nargin, "Analysis of Arrest Rates for Trends in Criminality". Socio-economic Planning Sciences. 8:221-27,1975.
16. Boggs, Sarah L. "Urban Crime Patterns", American Sociological *Review*. 30(6): 899-908, 1965.
17. Brenner, Harvey M. "Estimating the Social Cost of National Economic Policy: Implications for Mental and Physical Health, and Criminal Aggression", *Report to the* Joint Economic *Committee of the House and Senate.* Washington, D.C.: Congressional Research Service, 1976.
18. Carr-Hill, R.A. and N.H. Stern, "An Econometric Model of the Supply and Control of Recorded Offenses in England and Wales",Journal of Public Economics. 2:289-318, 1973.
19. Carter, Marshall and Otwin Marenin, "Law Enforcement and Political Change in Post-Civil War Nigeria", Journal of *Criminal Justice.* 9(2):125-49, 1981.
20. Carter, Robert M. et al. Corrections in America. Philadelphia: J.B. Lipincott Company, 1975.
21. Castillo-Barrantes, J. Enrique, "Prison Substitutes: Present Statusand Trends in Latin America", International *Review of Criminal Policy.* 36:47-54, 1980.

22. Chadha, Kunkum *The* Indian Jail; A *Contemporary Document.* Advent Books, 1983.

23. Clark, R. *Crime in America.* New York: Simon and Schuester, 1973.

24. Block, H.A. "Economic Depression as a Factor in Rural Crime", Journal of Criminal *Law* and Criminology. 40(4):468-70,November-December 1949.

25. Blumstein, Alfred, Jacqueline Cohen and Daniel Nagin, eds. Deterrence and Incapacitation; Estimating *Effects of Criminal* Sanctions on *Crime Rates.* Washington, D.C.: National Academy of Sciences, 1978.

26. Blumstein, Alfred and Richard Larson, "Problems in Modelling and Measuring Recidivism", Journal of *Research in Crime* and *Delinquency.* 8(2): 124-132, July 1971.

27. Blumstein, Alfred, Jacqueline Cohen and Harold D. Miller, "Demographically Disaggregated Projections of Prison Populations", Journal *of Criminal Justice.* 8:1-26, 1980.

28. Blumstein, A. and D. Nargin, "Analysis of Arrest Rates for Trends in Criminality". Socio-economic Planning Sciences. 8:221-27,1975.

29. Bogen, D. "Juvenile Delinquency and Economic Trends", American Sociological Review. 9(2): 178-184, April 1944.

30. Boggs, Sarah L. "Urban Crime Patterns", American Sociological *Review.* 30(6): 899-908, 1965.

31. Carter, Marshall and Otwin Marenin, "Law Enforcement and Political Change in Post-Civil War Nigeria", Journal of *Criminal Justice.* 9(2):125-49, 1981.

32. Carter, Robert M. et al. Corrections in America. Philadelphia: J.B. Lipincott Company, 1975.

33. Castillo-Barrantes, J. Enrique, "Prison Substitutes: Present Status and Trends in Latin America", International *Review of Criminal Policy.* 36:47-54, 1980.

34. Clifford, William "The African View of Crime", *The British Journal of Criminology.* 4(5):477-86, 1964.

35. Clifford, William An *Introduction to African Criminology.* London: Oxford University Press, 1974.

36. Clifford, William "Crime and Culture...and African Study", *Canadian Journal of Corrections,* i:157-166, 1966.

37. Clifford, William "Problems of Criminological Research in Africa South of the Sahara", *International Review of Criminal Policy.* (United Nations) 23:11-17, 1965.

38. Clinard, Marshall and Daniel Abbott *Crime in Developing Countries.* New York: John Wiley & Sons, 1973.

39. Cohen, S., D.C. Glass and S. Phillips "Environment and Health" In H. H. Freedman, S. Levine and L.G. Reeder, Eds., *Handbook of Medical Sociology.* Englewood Cliffs, NJ: Prentice Hall, 1979.

40. Corah, N. and J. Boffa "Perceived Control, Self Observation and Response to Aversive Stimulation", *Journal of Personality and Social Psychology.* 16:731-38, 1970.

41. Cory, Bruce and Stephen Gittenger *Time to Build: The Realities of Prison Construction.* New York: Edna McConnell Clark Foundation, 1984.

42. Curran, S.F., R.J. Blatchley and T.E. Hanlon "The Relationship Between Body Buffer Zone and Violence as Assessed by Subjective and Objective Techniques", *Criminal Justice* and *Behavior.* 5(1): 53-62, 1978.

43. Danser, Kenneth R. and John H. Lamb *Analysis of National Crime Victimization Survey Data to Study Serious Delinquent Behavior Monograph Four: Juvenile Criminal Behavior and its Relations to Economic Conditions.* U.S. National Institute for Juvenile Justice and Delinquency Prevention, Criminal Justice Research Center Washington, D.C., G.P.O., 1981.

44. Danziger, Sheldon "Explaining Urban Crime Rates", *Criminology.*14 (2):291-295, August 1976.

45. D'Artri, D.A. "Psychological Responses to Crowding", *Environment and Behavior.* 7:237-53, 1975.

46. Dean, L.M., W.M. Pugh and E. Gunderson "Spatial and Perceptual Components of Crowding: Effects on Health and Satisfaction", *Environmental Behavior.* 7:225-37, 1975.

47. Desor, J. "Toward a Psychological Theory of Crowding", *Journal of Personality and Social Psychology.* 21:79-83, 1972

48. Elias, T. Oluwale *Groundwork of Nigerian Law.* London: Routeledge and Kegan Paul, 1954.

49. Elias, T. Oluwale *Law and Social Change in Nigeria.* Lagos: Evans Brothers Ltd., 1972.

50. Elias, T. Oluwale, ed. *The Nigerian Magistrate and the Offender.* Benin City: Ethiope Publishing Company, 1972.

51. Elias, T. Oluwale, ed. *The Prison System in Nigeria.* Lagos: University of Lagos Press, 1968.

52. Engel, Kathleen and Stanley Rothman "Prison Violence and the Paradox of Reform (Effect of Liberalized Programs and Regulations Since the 1960s in Men's Prisons)", *Public Interest.* Fall 1983, pp. 91-105

53. Erickson, Maynard L. and Jack P. Gibbs "The Deterrence Question", *Social Science Quarterly.* 54:534-51, December 1973.

54. Essex, A.H. "Experiences of Crowding: Illustration of a Paradigm for Man-Environment Relations", *Representative Research in Social Psychology.* 4:207-18, 1973.

55. Ewing, A.C. *The Morality of Punishment.* Montclair, NJ: Patterson Smith, 1970.

56. Ezorky, Gertrude, ed. *Philosophical Perspectives on Punishment.* Albany, NY: State University of New York Press, 1972.

57. Fennell, John T. "Islands of Violence: The Crises of America's Prisons and Jails", *Journal of Social, Political and Economic Studies.* 8:81-91, Spring 1983.

58. Ferdinand, T. "Demographic Shifts and Criminality." *British Journal of Criminology.* 10:169-175, 1970.

59. Finn, Peter "Judicial Responses to Prison Crowding: While Many Judges Apparently Are Altering Their Sentencing Practices in Response to Inmate Population Increases, There Is No Consensus Among the Judges as to Its Responsibility for Resolving the Prison Crowding Problem", *Judicature.* 67:318-25, February 1984.

60. Finn, Peter "Prison Crowding: The Response of Probation and Parole", *Crime and Delinquency.* 30:141-53, January 1984.

61. Firey, W. "Limits to Economy in Crime and Punishment", *Social Science Quarterly.* 50(l):72-77, 1969-70.

62. Flanagan, Timothy J. and Edmund F. McGarrell *Attitudes of New York Legislators Toward Crimes and Criminal Justice: A Report of The State Legislator Survey-1985.* Albany, NY: The Hindelang Criminal Justice Center, 1985.

63. Fleishing, U. "The Social and Spatial Dynamics of a Prison: An Exploratory Study", *Man-Environment Systems.* 3(3):5-17, 1973.

64. Flynn, E.E. "The Ecology of Prison Violence" In A. Cohen, G.F. Cole and R.G. Bailey, eds. *Prison Violence.* Lexington, Mass.: Lexington Books, 1976.

65. Fox, James Alan *Forecasting Crime.* Lexington, Mass.: Lexington Books, 1978.

66. Fox, J. *An Econometric Analysis of Crime Data.* Ph.D. Dissertation, University of Pennsylvania, 1976.

67. Fox, James G. "The New Right and Social Justice: Implications for the Prisoners' Movement", *Crime and Social Justice.* 20:63-75, 1983.

68. Freedmam, J.L. *Crowding and Behavior.* San Francisco: Freeman, 1975.

69. Frum, David "Crime and Punishment: After 150 Years of Attempting to Reform Criminals, Experts are Reluctantly Concluding that Rehabilitation Does not Work", *Saturday Night.* 20:63-75, 1983.

70. Gest, Ted "Bulging Prisons: Curbing Crime...or Wasting Lives", *U.S News.* 96:42-45, April 23, 1984.

71. Gibbs, Jack P. "Crime, Punishment and Deterrence", *Social Science Quarterly.* 48:515-30, March 1968.

72. Gilbert, A. "Observations About Recent Correctional Architecture", *Prison Journal.* 51(1):7-14, 1971.

73. Glaser, Daniel *The Effectiveness of a Prison and Parole System.* New York: Bobbs-Merril, 1964.

74. Glass, D.C. and J.E. Singer *Urban Stress: Experiments on Noise and Social Stressors.* New York: Academic Press, 1972.

75. Goffman, E. *Asylums: Essays on the Social Situation of Mental Patients and Other Inmates.* New York: Doubleday 1961.

76. Harriman, Linda and Jeffrey D. Straussman "Do Judges Determine Budget Decisions? Federal Court Decisions in Prison Reform and State Spending for Corrections", *Public Administration Review.* 43:343-51, July/August 1983.

77. Henley, David D. and Lee R. McPheters "Crime as an Externality of Regional Economic Growth", *The Review of Regional Studies.* 4(3):73-84, 1974.

78. Hildreth, A.M., L.R. Derogatis and K. McCusker "Body Buffer Zone and Violence: A Reassessment and Confirmation", *American Journal of Psychiatry.* 127:77-81, 1971.

79. Hoch, Irving "Factors in Urban Crime", *Journal of Urban Economics.*1(2):184-229, April 1974.

80. Honderich, Ted *Punishment: The Supposed Justifications.* New York: Harcourt, Bruce and World, Inc., 1969.

81. Johnson, C.A. "Privacy and Personal Control", In D. Carson,ed.,*Man-Environment Interaction: Evaluations and Applications.* Strousbourg, PA: Dowden, Hutchinson and Ross, 1974.

82. Jourard, S.M. "Some Psychological Aspects of Privacy", *Law and Contemporary Problems.* 31: 307-318, 1966.

83. Kayode, Oluyemi "Some Notes on Research into Crime and Punishment in Nigeria", *Australia and New Zealand Journal of Criminology.*11: 241-51, 1978.

84. Kenny, Williams S. "Structures and Methods of International and Regional Cooperation in Penal Matters", *New York Law School Review.* 29(l):39-99, 1984.

85. Kinzel, A. "Body Buffer Zone In Violent Prisoners", *American Journal of Psychiatry.* 127: 99-104, 1970.

86. Kirk-Greene, Anthony and Douglas Rimmer *Nigeria Since 1970: A Political and Economic Outline.* London: Holmes and Meier,1981.

87. Krajick, Kevin and Steve Gettinger *Overcrowded Time: Why Prisons are so Crowded and What Can Be Done.* New York: The Edna McConnell Clark Foundation, 1982.

88. Lothstein, L.M. Personal *Space in Assault Prone Male Adolescent Prisoners.* Unpublished Doctoral Dissertation, Duke University, 1972.

89. Marrero, D.G. and M. Markowitz "Perceived Control and Correctional Strategy: Suggestions From Environmental Psychology", *Proceedings of the American Correctional Association.* 107th Congress, Milwaukee, Wisconsin, August 1977.

90. McDonald, Douglas *The Price of Punishment: Public* Spending for *Corrections in New York.* Boulder: Westview Press, 1980.

91. McReynolds, K.L. "Designing A Correctional Facility: From Program to Space—By A 'Consultative Process'", *Federal* Probation. 41:26-34, 1977.

92. Megargee, E.I. "Population Density and Disruptive Behavior in a Prison Setting", In A. Cohen, G.F. Cole and R.G. Bailey, eds. Prison *Violence.* Lexington, MA: Lexington Books, 1976.

93. Mehrabian, A. and J.A. Russell An Approach to *Environmental Psychology.* Cambridge, MA: MIT Press, 1974.

94. Milgram, S. "The Experience of Living in Cities", *Science.* 167:1461-8, 1970.

95. Milner, Alan *The Nigerian Penal System.* London: Sweet and Maxwell,1972.

96. Moyer, Frederick D. and Edith E. Flynn, eds., *Correctional Environments: A Summary of Recent Endeavors to Develop an Effective Correctional System Comprised of the Development of Full Citizenship* . Urbana, II: The Board of Trustees of the University of Illinois, 1971.

97. Nacci, P.I., H.E. Teitelbaum and J.E. Prather. "Population Density and Inmate Misconduct Rates in the Federal Prison System", Federal *Probation.* 41:26-31, 1977.

98. Nardulli, Peter F. Prison *Capacity and Sentencing Severity: A Look at Illinois, Michigan and Pennsylvania.* Urbana, II: University ofIllinois, 1983.

99. Nardulli, Peter F. *Prisons, Dollars and Crime.* Urbana, II: University of Illinois, 1983.

100. New Jersey General Assembly, Corrections, Health and Human Services Committee, *Public Hearing on the Cost of Prison Construction Projects.* Trenton, N.J.: October 24, 1983.

101. Odekunle, Femi "Capitalist Economy and Crime Problem in Nigeria", *Contemporary Crisis.* 2:83-96, 1978.

102. Okonkwo, Cyprian 0. and Michael E. Naish *Criminal Law in Nigeria.* Lagos: African University Press, 1964.

103. Okonkwo, Cyprian, 0. *The Police and the Public in Nigeria.* London: Sweet and Maxwell, 1966.

104. Paulus, P.B., V. Cox, G. McCain and J. Chandler "Some Effects of Crowding in a Prison Environment", *Journal of Applied Social Psychology* 5:86-91, 1975.

105. Paulus, P.B., G. McCain and V.C. Cox "Death Rates, Psychiatric Commitments, Blood Pressure and Perceived Crowding as a Function of Institutional Crowding", *Environmental Psychology and Nonverbal Behavior.* 3:107-116, 1978.

106. Petersilia, J. and P.W. Greenwood "Mandatory Prison Sentences: Their Projected Effects on Crime and Prison Population", *Journal of Criminal Law and Criminology.* 69:604-615, 1978.

107. President's Commission on Law Enforcement and Administration of Justice. *Task Force Report: Crime and Its Impact- An Assessment.* Washington, D.C. : U.S. Government Printing Office, Appendix D, pp.207-10, 1967.

108. Ray, D.W., D. Huntington, J. Ellisor and R. Prytulla "The Effects of Population Density Upon Juvenile Inmate Perceptions", *Journal of Humanics.* 6:122-129, 1978.

109. Read, J.S. "Criminal Law in Africa of Today and Tomorrow", *Journal of African Law.* 7(1):16-17, 1963.

110. Saegart, S. "High Density Environments: Their Personal and Social Consequences", In A. Baum and Y.M. Epstein, eds., *Human Response to Crowding* Hillsdale, N.J.: Erlbaum, 1978.

111. Schmidt, D.E. and J.P. Keating "Human Crowding and Personal Control: An Integration of the Research", *Psychological Bulletin.* 86:680-700, 1979.

112. Schuessler, Karl and G. Slatin "Sources of Variation in U.S. City Crime, 1950 and 1960", *Journal of Research in Crime and Delinquency.* 1(2):127-148, 1964.

113. Schumacher, Michael "The N.I.C. Model: A New Tool for Rating Criminals; Can This Lead to Fewer New Prisons", *California Journal.* 14:373-5, October 1983.

114. Shields, Patricia M. et al. "Using Volunteers in Adult Probation", *Federal Probation.* 46:57-64, June 1983.

115. Silberman, Charles E. *Criminal Violence, Criminal Justice.* New York: Random House, 1978.

116. Skogan, Wesley G. "Crime in Contemporary America" In Hugh Graham and Ted Robert Gurr *Violence in America.* Beverly Hills, Ca: Sage, 1979.

117. Spector, P. "Population Density and Unemployment: Their Effects of Incidence of Violent Crime in the American City", *Criminology.*12(0:399-401, February 1975.

118. Stewart, Jon *Understanding Econometrics.* London: Hutchinson & Co. Publishers Ltd., 1984.

119. Stokols, D. "On the Distinction Between Density and Crowding: Some Implications for Future Research", *Psychological Review.* 79:275-77, 1972.

120. Stokols, D. "The Experience of Crowding in Primary and Secondary Environments", *Environment and Behavior.* 8:49-86, 1976.

121. Sullivan, Richard R. "The Economics of Crime: An Introduction to the Literature", *Crime and Delinquency.* 19:139-149, April 1973.

122. Thompson, Roger "Prison Overcrowding", *Editorial Research Reports,* pp. 883-900, November 25, 1983.

123. Toch, H. *Living in Prison: The Ecology of Survival.* New York: Free Press, Macmillan, 1977.

124. Valins, S. and A. Baum "Residential Group Size, Social Interaction and Crowding", *Environment and Behavior.* 5:421-39, 1973.

125. Warner, Sam Bass *The Urban Wilderness: A History of the American City.* New York: Harper & Row, 1972.

126. Wicker, A.W. "Under-manning, Performances and Students' Subjective Experiences in Behavior Settings of Large and Small High Schools", *Journal of Personality and Social Psychology.* 10:255-61, 1976.

APPENDIX A

A. Time Series Data for New York

Table A.l
CROWDING DATA

Year	C	E_1	E_2	R
1965	0.304	3698200	3005663	1608.2
1966	0.215	6050620	4800253	2399.6
1967	0.124	5149515	8615271	2908.0
1968	0.034	3828426	9821470	3544.6
1969	0.0	3997984	10543508	3566.4
1970	0.0	6831833	10793314	3922.1
1971	0.0	9148890	11402050	4006.9
1972	0.18	9744670	13149170	4231.7
1973	0.18	6714194	12977004	4306.7
1974	0.266	3047332	12192473	4857.1
1975	0.266	5351708	9981203	5635.7
1976	0.312	8956497	13512385	6225.1
1977	0.352	17519048	12221291	6087.6
1978	0.308	19945425	9530481	5792.2
1979	0.335	10925412	8180647	6205.1
1980	0.353	6085034	9114020	6911.6
1981	0.31	4311984	7288934	6905.4
1982	0.328	14376783	9093567	6468.1
1983	0.373	20283002	9893193	5831.2
1984	0.295	34903304	12520891	5559.8
1985	0.355	57355263	15266975	5566.7

B. Time Series Data for Nigeria

Table B.1
CROWDING DATA

Year	C	E_1	E_2	R
1965	0.01	6388226	19790	170
1966	0.01	6724449	14928	160
1967	0.01	7078367	16528	165
1968	0.01	7450913	13029	179
1969	0.01	7843066	869	180
1970	0.01	8255859	968	182
1971	0.01	8690378	33831	183
1972	0.01	9147766	13600	187
1973	0.06	9629228	118400	204
1974	0.05	10136029	23380	185
1975	0.01	10669504	227633	178
1976	0.07	1231057	118214	217
1977	0.09	11822165	277922	210
1978	0.24	12444384	93600	219
1979	0.32	13099352	94400	220
1980	0.30	8000000	162354	203
1981	0.42	12850000	146034	198
1982	0.52	7649750	193578	254
1983	1.13	38552000	149091	394
1984	0.91	6100000	162764	472
1985	1.08	9581000	162866	445

C. Data Sources

1. Federal Republic of Nigeria, Federal Office of Statistics, *Statistical News.* 1965-1986.

2. Federal Republic of Nigeria, Federal Office of Statistics. *Quarterly Bulletin of Labour.* 1982-1984.

3. Federal Republic of Nigeria, Ministry of Finance. *Annual Budget and Expenditures.* 1964-1986.

4. Nigerian Police Force, *Annual Reports.* 1965-1985.

5. Nigerian Prison Service, *Annual Reports.* 1965-1986.

7. State of New York, Office of the State Comptroller. *Annual Report of the Comptroller.* 1964-1986.

8. U.S. Department of Justice, Federal Bureau of Investigation. *Uniform Crime Reports.* 1965-1985.

9. U.S. Department of Justice. *Source Book of Criminal Justice Statistics.* 1965-1985.

10. State of New York, Department of Commerce. *Annual Reports* 1965-1985.

11. State of New York, Department of Correctional Services. Unpublished Data on Inmate Releases and Follow-Up Studies.

12. State of New York, Department of Labor. *Annual Reports* 1965-1985