

A Critical Analysis of the Diets of Chronic Juvenile Offenders Part 1

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A review of the literature in the field of criminology discloses that little research has been done on the possible relationship between underlying biochemical or metabolic factors and resultant criminal behavior. Some of the research has been concentrated on hyper-aggressiveness, psychopathy and brain neurochemistry (Eichelman, 1977, Goldstein, 1974, Green-burg and Coleman, 1976, Monroe, 1978, Valzelli, 1974, Woodman et al., 1977, Yaryura-Tobias and Neziroglu, 1975). Other researchers, primarily outside the field of criminology, have examined immuno-psychological, genetic, and other psychophysiological factors. K. E. Moyer (1975) and W. H. Philpott (1976) for example, have presented evidence of a relationship between food allergy and hyper-aggression. Shah and Roth (1974) have concluded that the study of relationships between genetics and criminality "is not as conclusive as it could be." Numerous other studies by social scientists related to psychophysiological factors of criminality indicate that chronic misbehavior is not a function of subculture, socio-economic

status, or socialization. This last finding seems especially unfortunate since behavioral scientists have spent at least a half century examining environmental, psychological and sociological factors and their influence on criminality. This apparent failure raises the question, "are there then some neglected areas of study that might assist criminologists in understanding possible biological forces involved in deviant behavior?"

In more recent years, the concept that diet might be a variable to be considered in the study of deviant behavior has gained increasing support, leading to closer scrutiny. This concept is not new, however, and Dr. Tom A. Williams wrote in 1917 that "mild degrees of mental disturbances are dietetic-ally determined." He went on to state that "the lack of more extensive data regarding the dietetic factors in these cases is regrettable," while referring to numerous mental states (1928). There was some momentum with the research of Shannon (1922), Schlapp and Smith (1928), Greenwood (1935), Duncan (1935), Wilder (1940), Rojas (1941), Aldersberg and Dolger (1938, 1939). After that, however, the concept of a dietary relationship to criminal behavior lost out to other theories until the early 1950/5. Some of these pioneering researchers amassed considerable evidence in regard to the relationship of diet and improvement

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in the cases under study.

In a classic 1940 contribution to the Handbook of Correctional Psychology, Wilder compiled a long list of crimes or legal infractions that had been documented in the literature to have been related to demonstrated biochemical or metabolic disorders. The list included: disorderly conduct, assault and battery, homicide, larceny, embezzlement; destruction of property, arson, and traffic violations. All of these earlier researchers were medical scientists and not behavioral scientists and their suggestions were, for some unknown reason, neither accepted nor included in criminological theory. Until the early 1970's, any reference to the possibility of underlying biochemical or metabolic factors in connection with deviant behavior is extremely rare in the whole range of criminological literature.

Following the 1940's, a resurgence of interest in a biochemical-metabolic relationship to deviant behavior did not occur until over a decade later. In the early 1950's and 1960's, Goodhart (1957) and, particularly, Podolsky (1964), were reporting on new medical evidence of these relationships. As we moved into the 1970's one study after another appeared on diet and behavior, including criminal behavior.

Green reported on the indications of subclinical pellagra among penitentiary inmates (1978) and Davis and Walsh wrote in *Science* of a possible biochemical basis for alcoholism (1970). Russell Smith reported on his successful work with over 200 alcoholics using corrective diets and nutritional supplementation (1974).

In 1975, D'Asaro et al. studied the dietary patterns of jailed inmates in the Morristown jail, New Jersey. These researchers found that the inmates consumed significantly more sugar and caffeinated coffee than controls. Blood tests further revealed a profile clinically suggestive of functional hypoglycemia and violent behavioral tendencies. In another jail in Pitkin County, Colorado, the eating habits of inmates appeared to be in need of significant change in 52 percent of all cases evaluated (Randle, 1979). A study undertaken in Washington State, to evaluate the effects of nutritional education on adult probationers, showed a significant decrease, from an expected rate of 34 percent down to 11 percent

in the probationers' rate of recidivism (Schauss, 1978). In Ohio, as reported by Barbara Reed (1978), there was a similarly low re-arrest rate among offenders placed on probation and agreeing to remain on a strict improved diet

These studies and many others over the last sixty years suggest the need for not only more data, as Dr. Williams had suggested in 1917, but practical information to be applied by the offender, rehabilitation specialist, and correctional administrator.

Exploratory Study

A preliminary survey study of the dietary habits of adjudicated offenders was undertaken in September and October of 1978, by the first author. Ten juveniles with a history of delinquency were asked what their "typical diet was like on a recent school day while living at home." Each juvenile was interviewed for approximately 30 minutes. A tape recording was made of each interview to ensure accuracy of information. The results of that dietary survey were presented at the 1978 Annual Meeting of the Washington Corrections Association (Schauss, 1978).

The survey revealed, among many things, an average reported daily sucrose consumption of 12.02 ozs. (350 g) per interviewee. If this daily consumption were kept constant, each delinquent would have consumed at least 274 lbs. of sucrose in a year! This quantity is more than double the estimated average disappearance consumption of sucrose for the United States population (Hoffer and Walker, 1978, Newbold, 1975). One of the respondents reported a diet that included the consumption of slightly more than 20 ozs. (580 g) of sucrose a day. A rate of over 465 lbs. per year, if consumption remained constant!

Estimates of food and beverage consumption were made by using standard measuring cups, glasses and spoons, as guidelines during the interview. For example, if the interviewee indicated that he/she had a glass of cola, he/she was asked to indicate which size glass they commonly used

and how much it was filled. In this way an accurate estimate of actual proportions were made. **A Brand Name Guide to Sugar** (Shannon, 1977) was used as the reference for approximating actual sucrose content for each reported food or beverage.

This survey also revealed that the largest percentage of sucrose consumed by the interviewees occurred when snacking between meals. No subject reported consuming less than 7.5 ozs. (217.5 g) of sucrose per day. Whether such high levels of sucrose consumption each day could have an effect on the individual's ability to control behavior has been suggested by various medical specialists, nutritionists, and researchers. Because of insufficient funds, time, and sample population, no further evaluation was made of the diets of the subjects in this very preliminary study.

Hypothesis for the Present Study

These early efforts raise the question, "Are there any significant differences in the diets of juveniles with no history of arrest or adjudication and chronic juvenile offenders?" Stated in the null, "There is no significant difference in the diets (as measured by computer evaluation of dietary intake) between the experimental group (chronic juvenile offenders) and the control (juveniles without a history of arrest or adjudication)."

A chronic juvenile offender is defined as a juvenile that has been adjudicated for three or more offenses, during the previous 24 months, of which one offense must be a "felony" level violation. The adjudication history was determined by the juvenile court staff.

A group of "behaviorally disordered" (BD) juveniles, from the same geographical area and attending special education classes, was selected for the control group. This provocative choice was made in an effort to more clearly determine whether diet has an influence on chronic criminal behavior. Since both the BD subjects and the chronic offenders are viewed as having poor control over their behavior, this procedure would therefore reduce the impact of behavioral differences between the two groups. Further, chronic juvenile offenders would meet at least

one of the five required criteria necessary to be considered BD by the study site school district.

A behaviorally disordered student is one who exhibits consistent and persistent signs of behaviors such as withdrawal, distractibility, hyperactivity, or hypersensitivity. A student is eligible for a program if he/she exhibits learning problems that are not due primarily to mental retardation, and exhibits the following characteristics as evaluated by the section for special education, to the extent that he/she cannot take advantage of, or respond to, the "regular" program:

- a) exhibits an inability to build or maintain satisfactory interpersonal relationships with adults and peers;
- b) an inability to learn that cannot be explained by intellectual, sensory, or health factors;
- c) inappropriate types of behaviors or feelings under normal circumstances;
- d) general pervasive mood of unhappiness or depression; and,
- e) a tendency to develop physical symptoms, pain or fears associated with personal or school problems.

Most of the subjects used for the study exhibited characteristics of a number of the required criteria for admittance into the BD programs, rather than one criterion only.

Research Design

The reported study utilizes an ex-post-facto research design with one experimental and one control group. A stratified random selection process was utilized for assignment to the experimental group. A stratified random sample was developed for the control group as well. Upon completion of the experimental group's selection, the control group members were selected to match each experimental member by gender and age. All randomly selected offenders met the criteria for inclusion in the study. Thirty subjects were selected for the experimental group. The criterion established to randomly select the experimental subjects was that the gender ratio had to reflect the approximate ratio of male-to-female in the

general offender population.

A tape recording of the interview sessions was made during one session to be heard by the interviewers of the control subjects. The same instruments were used to question all respondents. Besides the questions on diet, ten other items were included in the questionnaire to determine differences between the groups.

The experimental subjects came from the King County Juvenile Probation Department and the Pierce County Juvenile Justice Center, Remann Hall. These agencies are within 35 miles of each other. Both chronic juvenile offenders on probation and in detention were selected for the experimental group. Nine of the experimental subjects were from King County and eighteen were from Pierce County. Three subjects in the experimental group were finally dropped when it was determined that they could not be matched by a BD subject of similar gender and age. This process resulted in two groups of subjects totalling 27 each, matched by age and gender.

Experimental Group

The juvenile offenders selected for the experimental group had each met the criteria for chronic offenders. Additional information was collected pertaining to their vital statistics, family situation, schooling, presence of diabetes in their family, smoking habits, and familial eating habits. Each subject completed a 50 item behavioral and physiological difficulty severity index called the Nutrition-Behavior Inventory (NBI). Eighty percent of the items on the NBI related to behavior.

Control Group

The BD subjects were selected by the Coordinator for Secondary Level Special Education in the School District. Subjects were selected from five schools in *the* school district. Each school has a self-contained classroom to handle these students, many of whom were considered severely behaviorally disordered. Six of the subjects completing the interview had to be eliminated from the study because it was determined that they had previous contact with

the local juvenile justice system and were replaced with other subjects with no contact.

Data Collection

All data on the experimental and control group subjects were recorded on the Diet Delinquency Survey (DDS) and the NBI. All of the data for Part I of this study were hand tabulated. The more complicated correlational research will be reported in Part II, at a later date.

Analysis of Data

When comparing the experimental and control subjects, the data indicated considerable similarity between the experimental and control groups forage (Figure 1):

Eight subjects were not matched perfectly for age, only two by more than one month. Similarly, the two groups were comparable in family composition (Figure 2):

There was a difference, but not significant, between the two groups in response to the question: "Do you eat with your family at breakfast, lunch, or dinner?" (Figure 3):

More than double the number of experimentals did not eat any meals with their families than did control group subjects.

Also asked was the question: "Do you smoke?" If so, "How many cigarettes a day?" (Figure 4):

In terms of the quantity of cigarettes consumed per day, the experimental group smokes far more cigarettes per day than the controls. Sixty-four percent of the offenders who smoked (N=9) consumed 20 or more cigarettes per day, compared to the controls who only had 30 percent (N=3).

When asked whether they knew of a record of diabetes in their family, four members of the control group indicated affirmatively (14.8 percent) while 7 subjects in the offender group reported it in their family (25.9 percent). In 6 of the 7 reported families in the offender group, it was indicated that their maternal grandparents had had diabetes. In the seventh case both the

DIETS OF JUVENILE OFFENDERS

FIGURE 1

	Age	Average Age
Experimental Control	15 years 7 months	16 years 2
males	15 years 7 months	16 years 3
Average		

FIGURE 2

Family Composition	Controls		Experimentals	
	N	%	N	%
Lives with mother and father	6	22.2	3	11.1
Lives with father only	0	0	4	14.8
Lives with mother only	10	37.0	10	37.0
Lives with mother and step-father	6	22.2	3	11.1
Lives with father and step-mother	1	3.7	1	3.7
Lives with foster parents	2	7.4	2	7.4
Lives with grandmother	0	0	1	3.7
Lives away from home unsupervised	0	0	2	7.4
Lives with aunt and uncle	1	3.7	0	0
Lives in a group home	1	3.7	0	0

Eat dinner with their families
Eat all their meals with their families

FIGURE 3

	Controls		Experimentals	
	N	%	N	%
Do not eat any meals with their families	5	18.5	12	44.4
	13	48.2	12	44.4
	9	33.3	3	11.1

FIGURE 4

	Controls		Experimentals	
	N	%	N	%
Do not smoke cigarettes	17	63.10	13	48.2
Do smoke cigarettes	37	14	51.9	

mother's grandparents and her brother (uncle) had a record of diabetes.

In evaluating the two groups' reported cravings for various preferred foods and beverages, several differences are evident, only one seeming very significant.

Among preferred foods, both groups report preferring steaks, pizza, and hamburgers far more than any other food. The importance of these three foods is in inverse relationship between the two groups. However, the rank order value of the three foods within each group and in comparison to the two groups is too minimal to be of any significance.

In the preferred beverages data, there appears

to be a very significant difference in the preference of cow's milk between the two groups. The offenders preferred milk twice as much as their second choice, the cola sodas. The control group's preference for beverages was the cola sodas first, followed by milk. The offenders picked milk almost three times as often as their top choice for a food, steaks. This obvious difference warranted a closer look at the actual consumption of milk by both groups. These data are found in Table 1. From these data it is apparent that there is a significant difference between the quantity of

TABLE 1

AVERAGE DAILY REPORTED CONSUMPTION OF MILK

Age	Experimentals		Age	Controls	
	Males n=23	Quantity reported in ounces		Males n=23	Quantity reported in ounces
10-5		48	10-4		0
13-4		48	13-4		32
14-2		56	14-2		42
14-4		48	14-4		16
14-10		88	14-4		16
15-2a		67	14-4		60
15-2b		40	15-2		24
15-2C		112	15-2		36
15-3		30	15-3		34
154a		20	15-4		8
154b		40	15-4		28
15-118		80	15-4		20
15-11b		92	15-11		8
16-0a		114	15-11		32
16-0b		56	16-1		56
16-4		70	16-4		48
16-10		36	16-10		32
17-3		92	17-3		88
17-4		44	17-5		12
17-7		44	17-4		12
17-8		68	17-4		0
17-10		112	17-10		22
17-11	X - 64.7 ounces Females n=4	82	17-11	X = 30.5 ounces Females n=4	76
Age	Quantity reported in ounces		Age	Quantity reported in ounces	
14-6		32	14-10		12
15-4		48	15-8		4
17-1		32	17-1		32
17-6	X - 35 ounces Total for all juvenile <n= offenders is 60.3 ounces/day	28 27	17-4	X = 17.5 ounces Total for all controls (n= is 28.6 ounces/day	22 27)

pasteurized/homogenized cow's milk consumed by the two groups. Both the male and female chronic offenders consumed twice as much milk whether analyzed together or separately in comparison to the BD subjects.

Even more significant is the comparison between each group's matched subjects. Out of 27 subjects in the offender group, only one BD subject exceeded the consumption of milk by the matched offender (15-3) and then only 4 ounces. In another matched set (16-0b=16-1), the consumption was the same. In all the other 25 matched subjects, the chronic offender nearly doubled or exceeded the BD subjects in milk intake. Since we would expect the consumption of milk to be similar for both groups, chi square was used to determine whether the reported consumption is significantly different using the following formula:

FIGURE 5

Control	Experimental		
reported	2	25	$\chi^2 - 1.9.8, df-1$
expected	13%	13%	$p < .0001$

The significant difference in milk consumption between the two groups allows us to reject the null hypothesis as false (Figure 5) in regard to milk. Given the need to analyze a wealth of additional data on the two groups' diets, it may be possible that other significant differences also exist between the two groups, particularly in relation to the calcium, phosphorus and magnesium ratios. The latter mineral is very important in adolescence for muscle growth and nerve, tissue development. Excessive milk consumption can reduce magnesium availability.

Curiously, the juvenile offenders' diets were very devoid of magnesium rich foods, such as: meat, fruits and green vegetables. This was not the case among the nonoffenders' diets.

Summary

A study was conducted to determine the diets of two groups of juveniles: first, a group of chronic offenders located in either the Pierce County or King County, Washington, juvenile court system; secondly, a group of matched controls selected from a population of moderately to severely behaviorally disordered students in the Tacoma Public School System. It was expected that the diets of these two groups would be similar and the null hypothesis or "no difference" was used.

The Nutrition Behavior Inventory was used to determine physiological and behavioral relationships between the two groups. A ten item survey instrument, the Delinquency Diet Survey, was used to gather data on the subject's lifestyle, familial background, and dietary habits. All interviews were recorded and answers validated.

The first group of completely matched subjects totaled 27 in the experimentals and controls. While a number of interesting relationships have been found, worthy of further study, an extremely significant relationship between the amount of milk consumed by each group was found. Matched males in the experimental group consumed an average of 64 ozs. of milk a day, while their controls only drank 30 ozs. per day. Females similarly showed the same pattern, with experimentals consuming 35 ozs. per day and controls 17 ozs. per day. Overall, the two groups showed a consistent pattern to that noted above, with experimentals consuming 60.3 ozs. per day and controls 28.6 ozs. per day. This difference occurs at the statistically significant level of .0001, allowing for the rejection of the null hypothesis, and raising many theoretical questions in regard to the relationship.

In this preliminary, ex-post-facto study of a limited number of carefully matched subjects, the data seem to support the conclusion that there are significant differences between the diets of chronic juvenile offenders and non-offenders. The findings are especially apparent in the relationship between consumption of milk and chronic

delinquency. Questions arise from this relationship that can only be answered by further in-depth analysis of the extensive data gathered. While pasteurized/homogenized cow's milk seems to be a factor at work somehow in this particular group of chronic offenders, there are at least 58 other items that need to be correlated and factored into a comprehensive statement.

Conclusion

It is crucial that a larger, controlled study of this type be conducted. The diet of children has been a concern of mankind since the dawn of history. The amount and type of food consumed by our children, however, seems to be a factor in whether they become involved with the juvenile justice system. High intake of refined sugar, processed food, and milk were among some of the important findings of this dietary study. However, it was high consumption of pasteurized/homogenized cow's milk which most glaringly revealed itself to be a significant dietary factor among juvenile offenders. This paper in no way is an indictment of milk or its benefit to children. It simply indicates that there is a relationship at work that does involve milk. We conclude that this needs further investigation and analysis. Further study could examine whether elimination or reduction of milk consumption would have a favorable effect on juvenile offenders' behavior and re-arrest rates.

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Differential Outcomes among Probationers Comparing Orthomolecular Approaches to Conventional Casework/Counseling

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Abstract

This study sought to establish whether the use of Orthomolecular approaches would result in reduced recidivistic behavior among misdemeanant probationers as compared to control groups receiving conventional counseling/casework.

A study sample of 102 misdemeanant probationers was selected by trickle random process into four groups. One experimental group received a nutritional counseling approach. The second experimental group was presented with six specific nutritional education modules of approximately 35 minutes per session. Each experimental group was compared against two control groups which received conventional casework/counseling.

Data were collected in regard to recorded offenses for each group for the twelve month period prior to placement with the study groups. Recidivism data was obtained for each member through arrest records for the 12 month period after placement on probation. Each group was compared to itself over time and each experimental group compared to its control group.

A null hypothesis was used throughout as the expected outcomes were not known.

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Background

As a state probation/parole officer in New Mexico's Second judicial District, I was presented with a particularly difficult challenge in the fall of 1970 (Schauss, 1978). A 14-year-old male, with a record of numerous recent felony and misdemeanor offenses, was assigned to me. His demeanor was sullen, his attitude "flat" and without emotion or remorse. After psychiatric examination, it was not clear why this young man was breaking the law.

In frustration, and to "protect" the public, it was recommended that the judge order this youth placed in the state reformatory. Having exhausted the normal armamentarium of procedures, it seemed to be the only logical thing to do. At that disposition hearing the youth's attorney convinced the judge to allow the young man to be examined for any physical problems at a local hospital's pediatric unit. The youth remained in detention between visits, while an extensive diagnosis was begun.

In one week we received a phone call from a female pediatrician. In a heavy Viennese accent, she inquired if we knew of a condition known as "Klinefelter's Syndrome." Confessing ignorance, I urged her to explain.

Chromatin based Klinefelter's Syndrome (Rosenthal, 1970) is a genetic category of seminiferous tubule dysgenesis, resulting in phenotypic males considered as incomplete

males, or male/female mixtures due to chromosome imbalances. A clear lack of physical masculine development resulted in a need for the youth to "prove" he was a man through "macho" behavior.

The pediatrician prescribed a treatment program consisting of hormone therapy and psychiatric sessions. The judge and I agreed, if skeptically, to the treatment recommendations. About five months later, the same young man was again in our office for a follow-up interview. No one in the probation department had seen the youth since he had been sent off to another state for treatment. Except for his name, I would never have recognized him! He had achieved noticeable physical maturity and his demeanor was vibrant and alive, demonstrating a vital affective personality.

My academic training had not prepared me for the broad possibilities of biochemical, genetic or ecological factors playing a part in criminal and delinquent behavior. Texts on deviance either exclude such discussions or argue against such linkages. An exception is the area of genetics and behavior (Beach, 1951, Johnson, 1968, Reckless, 1972, Sutherland, 1970). Some suggestions as to possible cause/effect relationships between biological factors and deviant behavior are reported. Means (1967) offered a number of arguments for further study, as did Bressler (1968). In Means and Parkes (1965), an effort was made to establish theoretical relationships between biological factors and social problems.

A few years later, as state assistant administrator for youth services in South Dakota, a curious statistic caught my eye. One particular group home seemed to have a significantly higher early release date than all others. Closer examination showed an average of 25 percent less "days placed" on the average per resident than all other similar facilities in the state. Not only were they leaving sooner, they were also doing better in their homes and communities as well. I attributed this factor to good casework and treatment methodology by the staff. When I visited this group home, I discovered something else.

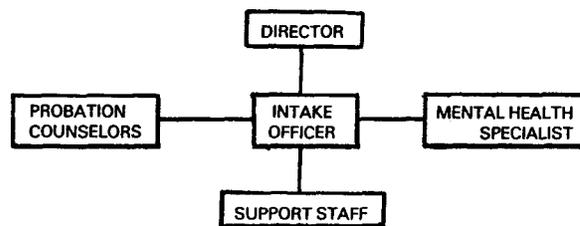
At a dinner meeting, the houseparents described their philosophy of diet and nutrition. They attempted to convince their wards to eat "whole" unprocessed foods, such as fresh vegetables and fruits in place of sugary sweets or nutrition-poor "junk foods." Minimal use of sugar was practiced and coffee and cigarette smoking discouraged. **It appeared that diet was a factor in influencing a more positive behavioral change in residents at that particular group home.**

Present Study

In 1977, I was appointed Director of the County Adult Probation Department in Pierce County, Washington.

The Probation Department, at the time of the reported research, was organized as shown in Figure 1. The department had seven probation counselors, with an average caseload of 93.5 cases per counselor. The department served all of the municipal and district level (misdemeanant) courts in the county.

FIGURE 1



During 1977, Pierce County had a population of 442,600, with the City of Tacoma (population 156,000) as its largest metropolitan community. Pierce County is the 23rd largest county in the state with 1676 square miles. Major industries by employment in the county are (non-agricultural): government (29,600); wholesale and retail trade (29,400); and services (25,000). The average annual unemployment rate for the Tacoma metropolitan area during the study was 9.7 per cent (Office of Economic Development Bulletin, 1978).

Serious traffic offenders represent approximately 70 percent of the supervision caseload (Misdemeanor Court Management Research Program, 1978). Within this group, driving while intoxicated cases accounted for more than 73 percent of the traffic charges. Among criminal misdemeanors, the largest group is larceny (31 percent), followed by assault (16 percent), and disorderly persons/resisting arrest (12 percent). Approximately 85 percent of the department's clients were white and male. Fifty-six percent of clients had an annual family income of less than \$5,000. Fifty-two percent of clients were employed full time.

This setting provided the opportunity to develop a research design to attempt to evaluate the effects of nutritional education and nutritional counseling as the experimental variable against traditional casework procedures on-going.

The outcome measurement was determined to be re-arrest rates at a specific time frame by probationers randomly assigned to the experimental and control groups.

Before deciding upon the experimental program, an extensive review of the literature on diet, nutrition and behavior was undertaken. Library resources were available and requests for bibliographic searches were coordinated with the National Institute of Corrections, the National Institute for Mental Health's Center for the Study of Crime and Delinquency, the Law Enforcement Assistance Administration's Criminal Justice Reference Service, and the National Council on Crime and Delinquency. Little had been reported in the literature of criminology and sociology according to these agencies. Studies on aspects of biochemical correlates of crime and delinquency were reported, but they were not particularly helpful. One of the more relevant works was a chapter in Glaser's **Handbook of Criminology**, entitled "Biological and Psychophysiological Factors in Criminality" (Shah and Roth, 1974).

It was in the literature of the biological and medical sciences that linkages between biochemical and ecological factors and behavior were to be found in abundance. Over 50 books

and nearly 135 articles provided a broad base for proposed research. The literature hinted strongly at some theoretical cause and effect relationship between diet, nutrition, brain damage, poor health, and criminal (deviant) behavior. The experiment was designed to test this theoretical relationship while also delving into possible practical or empirical significance.

Hypothesis

The hypothesis in this study was simple. Stated in the null, it said, "there would be no significant difference in recidivistic behavior (as measured by re-arrest during the 22 months covered by this study) between the experimental group (those who received one of two Orthomolecular approaches) and the control groups (those who received standard casework/counseling)."

(Recidivism is defined as an arrest during probation or after probation termination. An arrest was confirmed by police record checks from all neighboring Puget Sound area counties and the state criminal identification section. Additionally, the city of Tacoma's Police Department's records were also checked since Tacoma was the site of the study. Military police records at Mc-Chord Air Force Base and Ft. Lewis Military Reservation (also in Pierce County) could not be checked, but none of those probationers in the X1 or Y1 groups were military personnel).

Research Design

The reported study utilizes an ex-post-facto research design with two experimental groups and two control groups. A modified random selection was utilized for assignment to the experimental and control groups. Behavioral measures were used to determine differences between the groups, and recidivism, as herein defined, was the dependent variable for defining "success" or "failure" of subjects.

Probationers were referred from one of three sources: (1) a direct referral from a municipal court judge; (2) a direct referral from a district (county) court judge; or (3) as

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a transfer (courtesy supervision) from another county's probation department because the probationer's residence of record is Pierce County. The method of "trickle random selection"(Goldman, 1977) provided probationers in this study from all three referral sources.

All probationers placed in either the experimental group or in the control group, had been placed on probation by official order of the court at the time of assignment to experimental group X1 or group Y1 and to control group C1 or C2. All randomly selected probationers received probation sentences of from six to twelve months. Cases were processed at intake by intake officers, who then assigned them to the probation officers in the department according to caseload. Cases were distributed relatively evenly among the probation staff. Caseloads varied from 84 to 103 cases per probation counselor at the time the study began. No process was used to weigh case difficulty. Each case was assigned based on the availability of counselors, as measured by caseload factors.

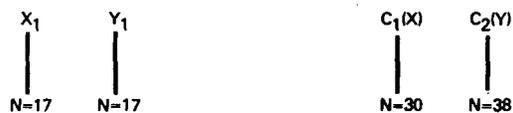
Before the study began, it was determined that the final random assignments would be as follows (Figure 2):

FIGURE 2



The actual number of probationers assigned to the study was as follows (Figure 3):

FIGURE 3



probation and were referred back to the

In experimental group X1 and Y1, one individual in each group was excluded from the study because they failed to appear for

originating court for disposition. The same problem accounted for 8 less probationers in C1 (Y1) than had been desired.

With two exceptions, no one in the system — judges, staff, or probationers — was aware of the research project. Any cases placed on probation and referred to the department by the presiding judge were not included in the study. This included only 3 cases. Every measure was attempted to minimize the "Hawthorne-effect" (Nunnally, 1975).

Experimental Group Y1

The probationers selected for experimental group Y1 had their basic history recorded for the department's records. A folder was begun to record each probation session. The probationers were then interviewed and given the following verbatim indoctrination:

*We are going to approach your probation a bit differently than you may have expected. During the next several weeks and months, we will explore any relationship that might exist between the foods and drinks you consume each day, your health, and the fact that you are on probation for an offense(s). To see if there might be personal problems occurring in your life that might be related to substances you are consuming, I want to give you a short inventory of 50 items (Nutritional Behavior Inventory). Based on the total score of the Inventory, we might be able to estimate how well or poorly you are functioning physically. **The score on this Inventory and your cooperation in this program will have absolutely no effect on the severity or length of your probation term.***

As an example, let us take item number 2. It asks whether your "gums bleed." Depending on whether they do or not, indicate in the adjacent boxes how severely they do. You could answer "never", "rarely", "occasionally", or "usually." A "usually" would be every day, or close to it, "occasionally" would mean every few days, "rarely" would

mean once in a while, say every couple of weeks, and "never", of course, is clear. Any question before you begin? (pause). If you have any questions on any item in the Inventory, please feel free to ask me. If you cannot read any item, I would be more than pleased to read them to you. The Inventory is then completed by the probationer and scored. Three of the probationers asked for assistance in reading some items. Of the 17 persons assigned to group Y1, 16 had significantly high enough scores (over 30 points) to suggest some possible biochemical-ecological problem. Since 80 percent of the items on the Inventory are related to behavior, the Inventory became a useful tool in periodically assessing any reported changes.

The entire Nutrition Education Program is not reviewed with the probationer at the first session. Rather, a new topic is introduced to the probationer at the beginning of each session. The session also begins with a question and answer review of the main points of each previous session. The topics of the session are as outlined below. Careful records showed that each session took from 21 to 60 minutes, depending upon the individual probationer's ability to absorb the information and the number of questions asked. No session ever exceeded 60 minutes. The average session lasted 36 minutes. Prior to the initiation of the Nutrition Education Program, the average length of time a probationer spent in a session with the probation counselor in the department was evaluated prior to the start of the study. The average session's length was 28 minutes, with a range of from two minutes to two and a half hours. The modal session lasted 32 minutes for the 125 probationers' records reviewed.

To provide conformity of presentation for the Nutrition Education group Y1, the following approaches were incorporated into the education model:

1. Initial rewarding of attention and persistence.
2. Differential reinforcement of learning performance.
3. Setting up specific learning goals.
4. Changing unacceptable behaviors systematically.
5. Modifying simple (not complex) behaviors.
6. New behaviors practiced in probationer's real life setting.
7. Continual evaluation and modification of

behavioral goals.

8. Educational presentation is systematic.
9. Present material sequentially.
10. Material broken down to simplest skills.

The Nutrition Education Program consisted of the following topics during each separate session:

Session #1: Processed Foods

- a. Facts about "white refined" sugar, brown sugar and honey.
- b. Facts about "white enriched" flour and other grains.
- c. What are "junk foods"?
- d. What does the body do with food and liquids?
- e. The Pancreas and Adrenal Glands.
- f. Homework Assignment: Evaluate your "junk food" consumption.

Session #2: Vitamins: A Short Course on Description, Use, Functions, and Effects on Behavior

- a. Review Session #1 and homework assignment.
- b. What are Vitamins?
- c. The fat soluble vitamins A, D, E.
- d. The water soluble vitamins B (complex), C.
- e. What are "antivitamins"?
- f. What about vitamin supplementation?
- g. Homework Assignment: Evaluate your vitamin intake for one day.

Session #3: Minerals: A Short Course on Description, Use, Functions, and Effects on Behavior

- a. Review Session #2 and homework assignment.
- b. Non-trace minerals: sodium, potassium, calcium, magnesium.
- c. Trace minerals: iron, copper, zinc, manganese, cobalt, selenium and chromium.
- d. Relationship to vitamins.
- e. Relationship to general health and behavior.
- f. Homework Assignment: Evaluate your mineral intake for one day.

Session #4: Toxic Metals and Basic Food Croups

- a. Review Session #3 and homework assignment.
- b. What are toxic metals?
- c. Proteins and Amino Acids.
- d. Fats.
- e. Carbohydrates.
- f. The need for the macro-nutrients.
- g. Review of Sessions 1-4.

Session #5: The Brain and other Ecological Factors

- a. Review Sessions 1-4.
- b. How does the brain basically work?
- c. The role of neurotransmitters and behavior.
- d. Light and its effect on behavior.
- e. Ions and their effect on behavior.
- f. Physical Exercise and how you feel.
- g. Review of all points in Session 5.

Session #6: Biochemical Individuality and Selecting a Diet

- a. What is biochemical individuality?
- b. Types of hypoglycemia and the Glucose Tolerance Test.
- c. The problems of carbohydrate in tolerance.
- d. What are cerebro-allergens?
- e. Selecting a diet best for you.

At no time was any note taking required, except for the homework assignments and the diet selection process. Outside reading was not required, although a bibliography was made available. However, attendance at each session was mandatory. The six sessions were completed in anywhere from 4 and a half weeks to 3 months and 2 weeks.

After the six "learning sessions" were completed, a basic counseling/casework approach with the probationer was maintained, if necessary. This was mandated in order to conform to the court's request to continue supervision of the probationer until termination of probation. Each probationer in experimental group Y1 was seen from once a week to once every other month until termination of supervision. Contact with each probationer after completion of the sixth session was made on an average of once a month. In four randomly selected cases, visits were made to probationers'

homes to visually inspect whether changes in diet and life style as reported in the probation office had actually occurred. A determination of dietary changes was made at either 30, 60, or 90 days after completion of the sixth session. These visits confirmed the probationers' statements.

Experimental Group X1

This group was processed by the assignment officer the same as group Y1. The probation officer concurred with the concepts of biochemical individuality and the genotrophic theory of disease (Williams, 1956, 1971). However, rather than follow a strict education process, as in group Y1j, this counselor was given the freedom to mix education with a pre-designed program of instruction.

A written program of instruction was developed by the probation counselor prior to the beginning of the study.

The nutritional counseling approach did not restrict its focus to only food. Included were suggestions for stress reduction, physical exercise and other "holistic" concepts (Grant, 1978). Nutrient supplementation suggestions were offered according to a chart. The chart specified quantities and frequency of intake of a number of vitamins and mineral supplements. The supplements were only suggested to those probationers having a significant score (over 30 points) on a modified Severity Inventory. Whether or not probationers followed the program was determined to be impossible to evaluate. In interviews with group X1 subjects, conflicting information was presented about their involvement in the program's prescriptions. Additional conflicting information was reported by nearly 40 percent of the group X1 subjects' families.

Probationers in this group were also afforded standard casework/counseling assistance at any stage of the probation. Sessions for this group from five minutes to slightly over four hours. From available records, the average session was determined to be 25 minutes. Sessions for the X1 group varied in frequency from twice a week to once every third month. Supervision of each probationer continued until

termination of probation. Because of department policy, each probationer was seen at least twice a month for the first third of their probation term. This was enforced for all but three of the X1 group. None of these three had prior arrest histories. The three did not account for any of the re-arrested population in the X1 group.

Control groups C1 and C2

Probationers assigned to control groups C1 and C2 were processed like experimental groups X1 and Y1. However, none of the control members were administered any Severity Inventories.

Control group clients were seldom assigned to probation counselors according to specialization because of the volume of cases and each counselor's large caseload. As a result, each counselor was required to assist probationers over a wide variety of areas. Counselors met with their clients in their offices, though field visits were occasionally made. Visits averaged thirty five minutes. Length of time spent with a probationer was determined by risk, or which client had more numerous or complex problems. Clients were less likely to be referred to outside community agencies, since counselors handling the controls preferred direct counseling. Counseling sessions dealt with alcoholism, drug

dependency, employment or job training, housing problems, clothing needs, health problems, legal concerns, personal or family problems, transportation needs, or minority concerns.

Data Collection

Twelve months after the last subject was randomly selected and placed in either groups X1, Y1, C1, or C2, police arrest records were searched from all those counties in the study area. From these records it was determined which of the 102 subjects had been re-arrested. The probationers' records were then matched, using previously developed codings, and sorted into the appropriate experimental and control groups. The data on probationers rearrested, with the number of recorded offenses per case, are shown in Figure 4, below.

In addition to re-arrest data, gender, age, and number of arrests twelve months prior to probation referral, were compiled.

Analysis of Data

When combining the C1 and C2 groups and comparing them to the X1 and Y1 groups, the data indicated considerable similarity between the control and ex-

FIGURE 4

Probationers Re-arrested and Number of Arrests per Probationer

Experimental Groups		Control Groups	
X ₁ (N=17)	Y ₁ (N=17)	C ₁ (X ₁) (N=30)	C ₂ (Y ₁) (N=38)
1	1	2	6
1	1	3	3
1	—	1	2
—	2	3	1
3		1	1
		3	2
		1	1
		1	6
		3	1
		6	1
		2	5
		—	2
		26	—
			31

perimental groups for gender. Similarly, age did not vary significantly between groups, except for the Y1 group which was seven years and two months younger on the average than control group C2.

Recidivism outcome data had shown the null hypothesis to be false (Figure 5):

between group X1, Y1, C1 and C2, we find:

$$z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

critical region = $z \leq +1.96, \geq -1.96$
 $\alpha = .05$

- X₁ ≠ C₁ z = -2.2771 (<.05)
- X₁ ≠ C₂ z = -2.44 (<.05)
- X₁ ≠ Y₁ z = -.4526 (ns)
- Y₁ ≠ C₁ z = -2.521 (≅.01)
- Y₁ ≠ C₂ z = -2.6882 (<.01)

FIGURE 5

Recidivism Data for X₁, Y₁, C₁, C₂

	N	# Arrested	%
X ₁	17	3	17.6
Y ₁	17	2	11.7
C ₁	30	11	36.6
C ₂	38	12	31.6

These suggested that the X1 and Y1 programs did have an effect on outcomes (recidivism) that was statistically significant for both groups, but more significant for the Y1 group than for X1. These outcomes led to the conclusion that there might be a difference between the various groups over time, using prior arrest data as a criterion.

The z score was used to compute the difference between means. Looking at just the ex-post-facto recidivism outcome data

A look at the arrest data for probationers during the period of twelve months before referral reveals the data in Figure 6:

FIGURE 6

Arrests for Probationers During 12 Month Period Before Referral

X ₁ (N=17)	Y ₁ (N=17)	C ₁ (N=30)	C ₂ (N=38)
0	2	1	0 0
0	2	0	0 2
0	0	0	0 0
0	1	0	0 0
1	1	0	3 0
0	1	0	3 0
0	0	1	3 1
3	0	0	1 0
10	1	0	0 —
2	2	0	1 37
0	1	2	1
1	3	1	0
0	0	1	0
2	2	0	0
0	2	0	0
0	—	0	1
2	18	0	1
—		0	1
21		0	5
		0	1
		0	3
		0	0
		1	0
		2	0
		0	0
		1	10
		—	0
		10	0

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Comparison of this data with the incidence of re-arrest for probationers X₁, Y₁, C₁, C₂ after referral as a measure of change over time (T) is shown in Figure 7.

FIGURE 7

Before, Referral	N	Offenses	\bar{X}	s ²	After Referral	Offenses	\bar{X}	s ²
X ₁ T ₁	17	21	1.2353	6.0664	X ₁ T ₂	3	.1765	.1544
Y ₁ T ₁	17	18	1.0588	.9337	Y ₁ T ₂	2	.1176	.11
C ₁ T ₁	30	10	.3333	.3678	C ₁ T ₂	26	.8667	2.1196
C ₂ T ₁	38	37	.9737	3.7021	C ₂ T ₂	31	.8158	2.640

Using z scores to evaluate the difference between various group means, we arrive at the following results (Figure 8):

FIGURE 8

Comparison of Means Between Groups Over Time

Hypothesis	z score	p
$X_1T_1 = X_1T_2$	1.75	ns (<.10)
$Y_1T_1 = Y_1T_2$	3.798	<.01
$C_1T_1 = C_1T_2$	-1.853	ns (<.10)
$C_2T_1 = C_2T_2$.3865	ns

The data seem to indicate that over a period of 12 months prior to assignment to 12 months following assignment, the following took place:

- (a) A positive change in arrest rates for the nutrition counseling group (X1) which approached a statistically significant level ($p < .10$), but falling short of $p = .05$; A highly
- (b) significant statistical change (decrease) in arrest rates ($p < .01$) for the nutrition education group (Y1); A negative change (increase) in
- (c) arrest rates for control group C1, approaching significance ($p < .10$); (d) No significant change in arrest rates for control group C2.

The recidivism rate for the nutrition education group was also found to be lowest, 11.7 percent, among all four groups. When combining the two experimental approaches and the two conventional casework control groups and looking at recidivism, the Orthomolecular ap-approaches' combined recidivism rate of 14.7 percent is slightly under one-half that of the control group's 33.8 percent. This occurred even though there was not a basic difference between the combined experimental and control group's age, gender, or marital status. Since the more successful nutrition education group had a probation population with more prior offenses before referral and were significantly younger than either of the control groups, it could have been reasonable to expect this group to do the worst of all four. In fact, it did the best.

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Conclusions and Recommendations

The data from this study suggest that a biochemical/nutritional emphasis or approach had a significant impact on the arrest rate of probationers over time. When a specifically designed six session nutrition education program was employed as the primary treatment method, this reached the statistically significant level of .01 in the positive direction. Also, when nutritional counseling was used as an alternative, a decrease in incidence of arrest over the same time period was also apparent, but failed to reach the .05 level (<.10).

Neither of the control groups, using conventional casework, showed a significant decrease in arrest rate during the 24 month period. Where probationers were exposed to this more traditional casework/counseling approach, one control group (C1) actually displayed a significant increase in the incidence of arrest ($p < .10$) over the same time period.

Although the results appear to be very positive for the correctional treatment approach in this study, one should be cautious in generalizing these results to the criminal offender population as a whole. However, based on the adult probationers randomly assigned to this study, it does appear that there was a significant difference in outcome between the more traditional counseling/casework methods and the Orthomolecular approach.

This study's findings should suggest additional research resources need to be marshalled to continue to evaluate such Orthomolecular approaches and their potential as yet another rehabilitation tool in the field of corrections.

Baseline Nutritional Changes Reported By Experimental Group Y1

	When Report	Subject Taken	Subject's Report
Y-1	(90 days)	No sugar, whole wheat from enriched white bread, no coffee, more sleep, more fresh fruits and vegetables, less sodas, no hard liquor, no drugs, exercise five times a week.	
Y-2	(90 days)	No sugar, particularly no more pastries (which he had eaten daily), eat breakfast, eat regularly, eat more high protein snacks (cheese, nuts), less sodas, exercise daily.	
Y-3	(90 days)	Less sugar, less coffee, eat more regularly, no alcohol.	
Y-4	(60 days)	Less sugar, no alcohol, eat more regularly, more fresh fruit (one a day from one a week), less "fast food" (no more than once every two weeks).	
Y-5	(90 days)	No sugar, no sodas, less coffee	

(one cup a day from 8-10), good breakfast, eat at home rather than at fast food places.

Y-6 (60 days) Less sugar, cooking with less heat, less meat—more vegetables, more fruits, avoid white bread. Y-7 (60 days) Less sugar, less coffee (2-3 cups from 5-6 a day), less alcohol

Y-8 (90 days) No sugar, decaffeinated coffee only (2 cups a day), whole wheat bread only, exercise 3-4 times a week for 30 minutes, more fruits and vegetables. Y-9 (60 days) No sugar, less meat,

no coffee or tea, more water for drink and milk, exercise for one hour daily around noon, avoid food coloring and additives, take niacin and a complete multi-vitamin with minerals daily.

Y-10 (60 days) Less sugar, less cigarette smoking, less coffee (1-2 cups a day from 5-8 a day), no alcohol.

Y-11 (80 days) No sugar, less coffee (1 cup a day from 5-10), more fruits and vegetables, cook with less heat (pan fry, deep fry less; no more pressure cooker).

Y-12 (60 days) Less meat, less sugar, less "junk food" like cupcakes, potato chips, pies, cakes, donuts; more nuts.

Y-13 (90 days) No sugar, no alcohol, whole wheat bread, less coffee (3 cups from 5-7 a day).

Y-14 (30 days) None reported.

Y-15 (60 days) Less sugar, less coffee (2-3 cups a day from 4-8), snack on protein snacks.

Y-16 (30 days) No alcohol, no sugar.

Summary of Results

8 report "no sugar" in diet, meaning: "sugar is not added to food or drink; foods or drinks with added sugar are not bought (or avoided)."

- 7 report "less sugar" in diet, meaning: "an effort is made to reduce the amount of sugar added to food or drink by at least 50 per cent, foods or drinks with added sugar are avoided whenever possible."
- 2 report "no change" in diet, meaning: still use sugar in same amounts as before being placed on probation; no effort is made to avoid foods or drinks with added sugar.
- 8 report "less coffee" (as indicated in cups) being consumed than before.
- 2 report "no change" in coffee consumption (all drank more than 3 cups a day).

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