ANALYSIS OF AVAILABLE STATISTICAL DATA RELATED TO PREVENTION ISSUES

Prepared for:

The Maine Commission to Revise Statutes Relating to Juveniles

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INTRODUCTION

In order to analyze data about "prevention", we must formulate some clear ground rules pertaining to this elusive concept.

What is to be Prevented?

First, the term "prevention" is meaningless without some specific definition of what is to be "prevented". Moreover, there must be some means of measuring what is to be prevented,

Two measures are used for this paper.

1. Total Juvenile Part I and Part II arrest rates.

Total juvenile arrest rates for each county in Maine are currently the best available indicator of the relative level of juvenile crime and delinquency throughout the state. We are making the assumption that lower rates, by definition, mean that successful prevention has occurred. Whether or not these lower rates are the result of consciously conceived services is a question we hope to address in greater detail below.

2. Rate of children dropping out of school.

The Commission has specified the "dropout" problem as a major target for preventive services. The selection of this measurement implies that there is some causal link between dropping out of school and engaging in the type of behavior that leads to delinquency or is itself delinquent or criminal. It is also probably socially desirable to maximize the chances that children will complete their school careers.

Thus, lower dropout rates are considered to show that dropping out has been "prevented", whether or not a link to a specific service has been established.

What is Prevention?

The second consideration has to do with the appropriateness of the (medical) prevention model to social problems. Three types of prevention are often distinguished in the health, and, more recently, the mental health fields:*

Primary prevention is actually direct intervention--the treatment persons who have contracted a disease (or sustained an

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* We are not discussing the "crime prevention" field here because the emphasis on detection and law enforcement technology is inappropriate to the treatment/development purpose of Maine's juvenile statutes.

injury). The equivalents in the juvenile justice area would be the identification, assessment, and treatment of juveniles having committed offenses.

Secondary prevention involves treating the healthy individual or population so that disease does not occur. Inoculation programs are the obvious example. Secondary prevention for juvenile justice might include police presence or other deterrants, the opportunity to engage in activities that cut down the amount of time available for delinquent behavior, and, more importantly, the provision of services that modify or extinguish delinquent behavior.

Tertiary Prevention involves the attempt to change the environmental or social context of disease, often using public awareness campaigns and educational programs. Programs designed to make people aware of youth services or to improve family life could be considered tertiary prevention in the juvenile delinquency area.

The problem with applying the (medical) prevention model to delinquency is that while specific micro-organisms and organic dysfunction can be linked to specific diseases,

the causes of delinquent behavior are not well established. Consequently, there are no sure anti-toxins for delinquency.

Because the causes of delinquency are complex and only vaguely known, and because the effectiveness of various youth services has never been well established, inferences drawn from data about prevention are, at best, tenuous.

What can we conclude about preventive service effectiveness?

Finally, because of the way our data are structured, the analysis should not be interpreted to reflect on the quality or effectiveness of specific services. For example, it turns out that camperships given to youths correlate positively and significantly with dropout rates. This means that the more camperships given in a county, the more likely that county is to have a high dropout rate. If the campership program is supposed to serve as a method of preventing dropouts, it might appear that the program is not effective statewide. However, an in-depth study of youth participating in the campership program compared to those who do not participate might show that participants have a significantly lower dropout rate. In this (hypothetical) case, one might conclude that in fact the campership program is effective for those it serves, but does not serve enough children, or, perhaps, the right children. Unfortunately, specific in-depth

information of this type is beyond the scope of this project and is not otherwise available.

In addition, the reader should keep in mind that the variances (differences) measured by our data are meaningful only at the county level.

While the county-by-county analysis is fully justified because juvenile court and other social services are administered at the county level, the aggregate county figures may mask important intra-county (city, township or LEA) patterns. For instance, it was expected that juvenile arrests might show a positive correlation with number of children in families below the poverty level. Instead, juvenile arrests showed an insignificant negative correlation with children in families below the poverty level.

We cannot tell whether wealth and delinquency are distributed evenly throughout the counties. Only by looking below the county level can we discover whether there are pockets of poverty with higher juvenile arrest rates than the surrounding areas of greater wealth.

It may in the future be desirable to undertake another study of the same variables at a more discrete level.

Methods

The two methods used to analyze county-by-county delinquency and dropout rates were correlation and partial correlation.

Correlation, explained in a brief working paper presented to the Commission in April, permits us to test hypotheses about the relationship between two variables, such as juvenile arrest rates and urbanization.

A "correlation coefficient", which may range from -1.000 to +1.000 is an index of the linear relationship between two variables. A coefficient of -1.000 shows a perfect negative relationship--a higher value for one variable will predict a lower value for the other. On the other hand, a coefficient of +1.000 shows a perfect positive relationship--a higher value for one variable will predict a higher value for the other. A coefficient near "0" shows no linear relationship.

Usually, a correlation coefficient falls between -1.000 and +1.000. However, in order to infer a positive or negative relationship between two variables, we need to know (1) the value of the coefficient and (2) the number of cases studied (for this project, Maine's 16 counties). Accordingly, we have noted the significance of each coefficient. A correlation is usually considered "significant" if a coefficient of a given size would occur by sheer chance less than five times out of a hundred.

The major drawback of correlation analysis (and of multiple regression) is its inability to test causal hypotheses. For example, a significant positive correlation

between two variables may reflect the fact that both variables are separately and independently related to a third variable--in other words the correlation is "spurious". In examining the correlations among many pairs of variables or looking at the results of a multiple regression analysis, it is often possible to formulate several alternative explanations that fit the same data.

Fortunately, work in the analysis of "recursive" systems of equations provides a way of stating and testing causal relations among a dependent and several independent variables.* Proponents of this method emphasize the inferential nature of conclusions drawn from the data, and recommend a common sense approach to formulating the causal models.

The specific technique is called "partial correlation", which mathematically holds constant or controls for the effects of one or more variables while testing the relationship between two other variables.**

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* Journal of the American Statistical Association, 1954, Vol. 49, p. 467-479, H.M. Blalock, Jr., "Four Variable Causal Models and Partial Correlations"; American Journal of Sociology, Vol. 68, p. 182-194; Norton, N.Y., 1974; Herbert A. Simon, "Spurious Correlation: A Causal Interpretation".

** The formula for correlation of i and j, holding k constant is given:

$$r_{ij,k} = \frac{r_{ij} - (r_{ik})(r_{jk})}{\sqrt{1-r_{ik}^2}\sqrt{1-r_{jk}^2}}$$

when r_{ij} = correlation between i and j, r_{ij} = correlation between 1 and k and r_{jk} = correlation between j and k.

Thus it is possible, for instance, to see whether juvenile Part I arrest rates continue to correlate significantly with urbanization if prevalance of law enforcement officers is held constant.*

Variables Analyzed

Dependent variables

The two measures of "prevention" stated on pages 1 and 2 are the dependent variables analyzed. In other words, we will attempt to explain the county-by-county variances in rates of total juvenile arrests and rates of children dropping out of school.

Independent variables

Two types of independent variables were used to attempt to explain the variances in county rates of juvenile arrests and dropouts:

- Socio-economic variables

  A variety of socio-economic factors are assumed to relate to a high incidence of human problems. Many of these factors are said to reflect such sociological concepts as the "culture of poverty", and "family disruption".

  Fortunately, there is an abundance of information of this type available for each of Maine's 16 counties. The variables used included:

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* The answer was, by the way, yes.

1. Urbanization (% population living in Urban Areas)
2. Poverty (children living in families below poverty as % population under 18)
3. Divorce (divorces as a % of marriages)
4. Children living in single parent families as % population under 18
5. Home ownership (% housing units occupied by owner)
6. Residential mobility (% housing units moved into during 1965-1975)
7. Median family income
8. White collar workers (as a % of employed civilian labor force)
9. Unemployment (persons unemployed as % civilian labor force)

The first four variables came from materials shared with us by the Children and Youth Services Planning Project. Variables 5-9 were derived from County and City Data Book, 1972.*

There are two reasons to use these variables. One purpose is to test some commonly voiced opinions about the relationships between these factors and delinquency. The other purpose is, given the discovery of any significant relationships and appropriate causal inferences, to provide the

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* U.S. Department of Commerce, Social and Economic Statistic Administration, Bureau of the Census.

Commission with information that may help focus prevention programs on specific target groups or areas.

Another variable we have included, called "police", is the number of full-time law enforcement officers per 1,000 population.* While this is not strictly a "socio-economic variable, it has been suggested as a possible factor biasing arrest reports, and is certainly worth analyzing.

- Human service variables

Persons planning services for children and youth should be interested to discover whether there are any significant relationships between various service measurements and rates of juvenile arrests or dropout rates. Presumably, an effective statewide program would show that a higher level of one or another children's service would correspond to lower arrest rates and/or dropout rates. (Remember that we are not talking about the quality or effectiveness of any specific service agency or organization.)

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* From Crime in Maine, 1975, State of Maine, Department of Public Safety.

Eight variables were included to represent the level of various children's services in each county:

1. Child welfare caseload (number children receiving services per 1,000 population under 18)

2. Foster care (number licensed homes per 1,000 population under 18)

3. Homemaker Service (number individuals per 1,000 population)

4. Campership program (number children receiving camperships per 1,000 population under 18)

5. Mental Health Service (number children admitted to mental health clinics per 1,000 population under 18)

6. Special Education (number pupils in special classess--excluding TMR--as % enrollment)

7. Low-income education (dollars for low income education per total enrollment)

8. Student-teacher ratio (number pupiles enrolled per classroom teacher)

Although it is not really an indicator of service, we also included number of individuals receiving AFDC as a % of total population.

Analysis

Simple Correlations

The table attached to this paper is a "correlation matrix". This correlation matrix displays coefficients

calculated between each pair of variables included in the analysis. Only the lower half of the matrix is displayed because the upper half would show the same coefficients, but in reverse order. Note that all the diagonal cells of this table, if filled in, would read 1.000. This is because the diagonal represents each variable's correlation with itself--which is, of course, in each case a perfect, positive correlation.

Those coefficients that are significant at the .05 level or better are clearly marked on the table.

Correlations with the dependent variables

Interestingly, there is no significant relationship between our two dependent variables--juvenile arrest rates and school dropout rates (.3102). This lack of correlation does not in itself refute the hypothesis that dropouts are morely likely to become delinquent. Rather, it simply tells us that knowing a county's dropout rate will not help us predict its delinquency rate.

There are several significant correlations with juvenile arrest rates:

Variable	Correlation Coefficient
Urbanization	.7841
Median Income	.5677
Divorce	.5589
Single Parent Families	.5717
Home Ownership	-.7625
Residential Mobility	.5565
Police	.7108
Mental Health	.6226

On the face of it, most of these correlations would appear to support some of the sociological concepts about "family disruption" (divorce, single parent families) and "anomie" of modern life (urbanization, residential mobility, and the negative relationship to home ownership) being the conditions that spawn delinquency. However, the positive correlation between juvenile arrest rates and median family income--implying that wealthier counties may be expected to have higher juvenile arrest rates is puzzling.

It is disappointing to see that only one significant correlation arose between our service variables and juvenile arrests: mental health (.6226). While this positive relationship could be interpreted as overall ineffectiveness of mental health programs (the higher the level of mental health effort, the higher the arrest rate), it is also possible that the relationship is reversed: the multiple problems represented by high juvenile arrest rates also lead to more mental health referrals. The lack of significant correlation between mental health service and any of the other service or socio-economic variables means that we had to exclude mental health from our causal model (see, pp. 18-22).

The other dependent variable--rate of school dropouts--shows only one significant correlation: camperships (.6158). Thus, counties having high dropout rates also award the most camperships!

Correlations among socio-economic variables

In addition to the significant correlations with juvenile arrests (discussed above) socio-economic variables show some highly significant inter-correlations:

Urbanization correlates significantly with:

Median income	(.5560)
Divorce	(.5516)
Home ownership	(-.9292)
White collar work force	(.4993)
Residential mobility	(.8017)
Police	(.4999)

Poverty correlates significantly with:

Median income	(-.8640)
Low income education	(.9661)

Median income correlates significantly with (in addition to urbanization and poverty, shown above):

Home ownership	(-.6564)
White collar work force	(.6292)
Residential mobility	(.6530)
Unemployment	(-.7919)
Police	(.5421)
Low income education	(-.8220)

Divorce correlates significantly with (in addition to urbanization, shown above):

Single parent families	(.6127)
Residential mobility	(.5109)
Foster care	(-.5354)

Single parent families correlates significantly with (in addition to divorce):

Police	(.5246)

Home ownership correlates significantly with (in addition to median income and urbanization, shown above):

Residential mobility	(-.7970)
Police	(-.5497)

White collar work force correlates significantly with (in addition to median income and urbanization, shown above):

Residential mobility	(.5505)
Police	(.6216)

Residential mobility correlates significantly with (in addition to white collar work force, home ownership, divorce, median income, and urbanization, shown above):

Unemployment	(-.5932)

Unemployment correlates significantly with (in addition to residential mobility and median income, shown above):

Low income education	(.6098)

Police correlates significantly with (in addition to white collar work force, home ownership, single parent families, median income, and urbanization, shown above):

Foster care	(-.5517)

The inter-relationships among the socio-economic variables and between the socio-economic variables and some of the service variables (low income education and foster care) suggest many questions about family life, mobility, and the social and economic structure of Maine's counties. Further research might use these and other

similar variables to construct a detailed model of the state, perhaps using cluster or factor analysis. For our purposes, however, the relationship suggested by these correlations will be used in the section on partial correlation to develop and test causal models of delinquency and school dropouts.

Correlations among human service variables

The discussions above revealed only two significant correlations between our dependent and service variables--juvenile arrests and mental health (.6226), and dropouts and camperships (.6158). In addition, there are only five significant correlations between socio-economic and human service variables--Poverty and low income education (.9661), median income and low income education (-.8220), divorce and foster care (-.5354), unemployment and low income education (.6089), and police and foster care (-.5517).

What inter-correlations exist among the human service variables?

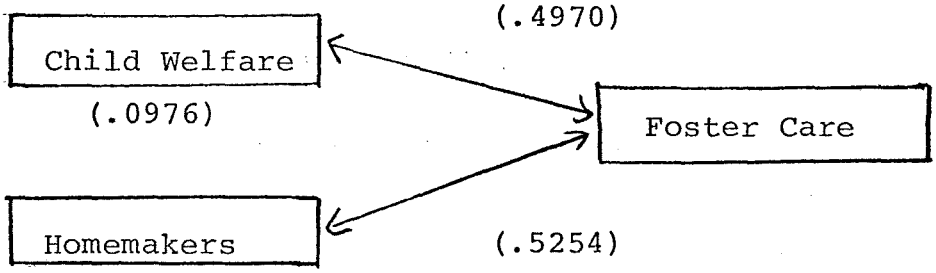
Mental health, AFDC caseload, camperships, homemakers, low income education, and pupil-teacher ratios were not significantly correlated with any other human service variable.

However, foster care and homemakers showed a positive correlation (.5254) as did child welfare and foster care (.4970). Unexplicably, child welfare was significantly, negatively related special education--the higher the child

welfare caseload, the lower the proportion of children enrolled in special education.

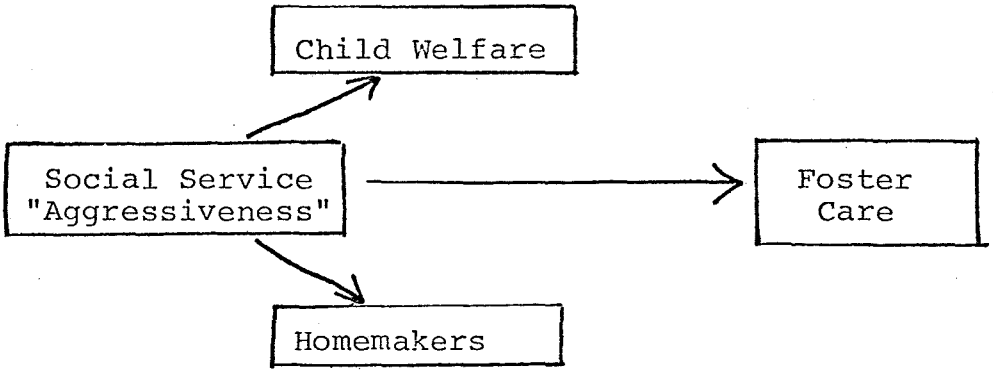
Thus, the human service variables do not look very promising as factors for inclusion in our causal modeling. This finding is disappointing because we had hoped to construct a model showing interaction between socio-economic conditions and service effort levels to explain delinquency and dropout rates.

The data regarding homemaker service, child welfare, and foster care, however, shed some light on the dynamics of the welfare system. The relationships can be illustrated:



The positive, significant relationships between child welfare and foster care, and between homemakers and foster care, while child welfare and homemakers remain insignificantly correlated probably reflects the structure of the welfare system. Foster care homes serve <u>both</u> adults and children; child welfare services serve children, while homemaker services are provided to adults (although children may benefit from these services).

Thus, it is possible that all three variables result from a fourth variable for which we have no measure--the level of effort or aggressiveness of the county welfare and social service departments. The resulting model might look like this:

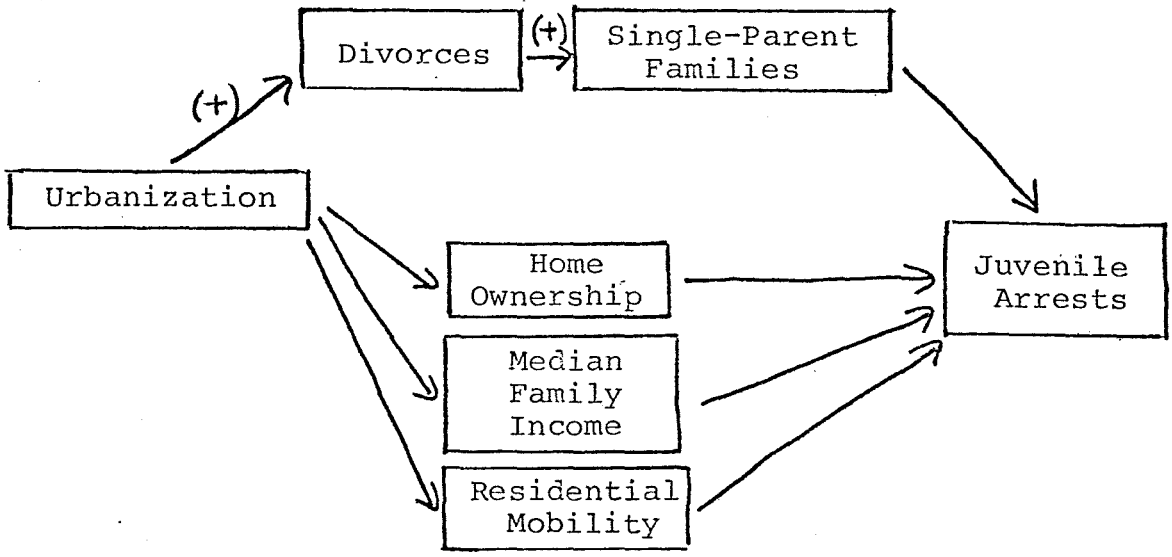


The section below uses the significant coefficients to develop and test a causal model that should help the Commission evaluate proposals for preventing delinquency and dropouts.

Partial Correlations and Causal Modeling

We know that juvenile arrests are significantly correlated with the eight variables on page 12. Many of these variables are also significantly correlated with each other. We would like to identify those variables that may be considered the more "immediate" causes of juvenile arrests, and to eliminate other variables from the causal model. For instance, the juvenile arrest rate is most highly correlated with urbanization, but it is also highly correlated with other variables--home ownership,

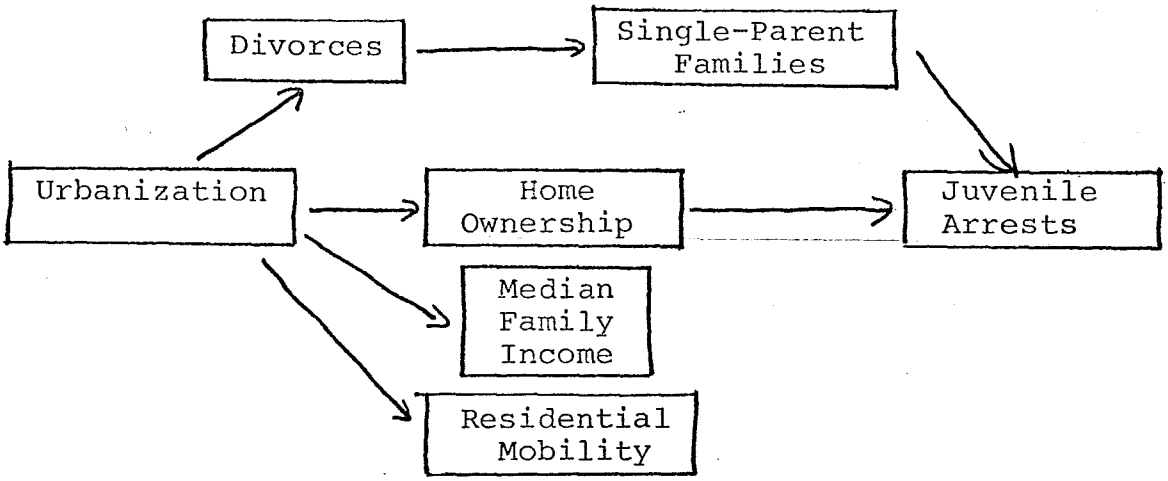
single parent families, divorces, median family income, and residential mobility--which are also all significantly correlated with urbanization. Can some of these other variables be the "intervening" variable which explain how urbanization affects the juvenile arrest rate? Does urbanization, for instance, affect the juvenile arrest rate through its effect on the divorce rate, on the extent of home ownership, on median family income and residential mobility? Does the divorce rate directly affect the juvenile arrest rate, or does it affect it indirectly by causing an increase in the number of single parent families? Schematically, we are asking if this is the way these variables are inter-related:



We can test all or parts of this 'causal model" using partial correlation analysis. If the model is valid, we would predict that certain partial correlation coefficients--those between variables <u>not</u> directly connected by arrows

in the model--will approach zero if we hold constant common antecedent causal variables. Thus, we would predict that the partial correlation between juvenile arrests and divorces, holding constant urbanization and single-parent families, approaches zero, and that the partial correlation between juvenile arrests and urbanization, holding constant single parent families, home ownership, median family income, and residential mobility approaches zero.

The actual partial correlation coefficients are, respectively, .0935 and .0959. Given the possibility of measurement error, these coefficients are small enough for us to accept this model provisionally. However, it may be possible to further simplify the model by eliminating some of the "arrows" that we have used to imply causal relationships. Specifically, can we eliminate the arrows connecting residential mobility to juvenile arrests, and connecting median family income to juvenile arrests? Eliminating these arrows would show that what we are asking is the correlation between each of these two variables and juvenile arrests is a "spurious" correlation, resulting from the fact that residential mobility, median income and juvenile arrests all vary with urbanization. Schematically, we are proposing this model:



We are predicting that the partial correlation between urbanization and juvenile arrests, holding constant only two variables--single parent families and home ownerships--will be zero. In fact, it is very close to zero: -.0095.

This finding confirms that the proposed model is acceptable, given available data and what we know about the system. This does not mean that other models of equal plausibility cannot be proposed and tested.

There are obvious implications for recommendations to implement and expand "preventive" services.

- Such programs might be concentrated on counties having high numbers of single parent families and low rates of home ownership
- Services might be designed to remediate whatever problems are associated with a high incidence of single parent families

- More in-depth research should be undertaken to verify that it is indeed the children of single parent families who become delinquent. (The data here do not prove that this is the case.)

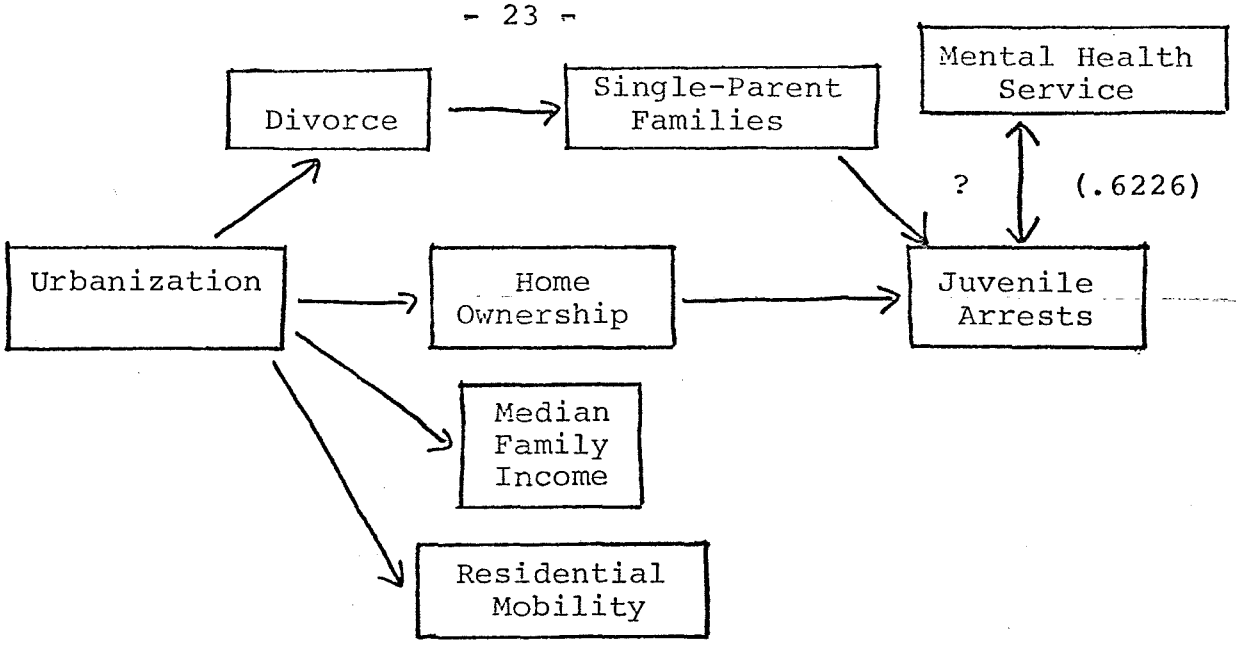
ecological correlation

- The Commission might want to ask participants at its hearings about the possible reasons for the apparent negative relationship between home ownership and delinquency, especially since poverty and income factors are not involved in this relationship.

The lack of significant correlations that would permit us to link human service variables to socio-economic variables and to juvenile arrests precluded the introduction of service variables into the causal model.

However, recall that there was one significant, positive correlation between mental health service and juvenile arrests (.6226). This relationship appears to be independent of the other causal linkages in the model, and, in fact, independent of any of the other variables analyzed.

Thus, our model can be elaborated by the introduction of one more unexplained relationship, which is represented by the two-way arrows between mental health service and juvenile arrests:



Commission members might ask participants at the hearings:

- How the relationship between mental health service and juvenile arrests might be interpreted
- What data might be used to help us explain this phenomenon

In the introduction of this paper we proposed to discuss prevention in terms of what is to be prevented. We singled out juvenile arrest rates and school dropout rates as measures of two problems that might be targets of preventive services. The juvenile arrest rate was significantly correlated with several socio-econimic variables, it was possible to construct a causal model suggesting which of these socio-economic variables were the immediate determinants of juvenile delinquency. On the basis of this model we suggested where preventive services

might be directed and proposed areas of follow-up questioning and research. The same could not be done with the school dropout rate, a variable which was not significantly correlated with any of our socio-economic variables or with juvenile arrests. This analysis alone does not permit us to identify determinants of a high dropout rate, to suggest where preventive services should be directed or to say what type of preventive services might be effective.

The highest dropout rates are in Lincoln, Cumberland, Sagodahoc, Kennebec, Waldo, Knox and York counties, a cluster of counties on the south-eastern coast. The dropout rate falls as we move away from this south-eastern cluster. It may be that there is some variable or variables for instance, opportunities for juvenile employment, or other incentives to leave school, which will explain this geographical pattern in the school dropout rates.

Perhaps the Commission can elicit some suggestions for explaining this pattern.