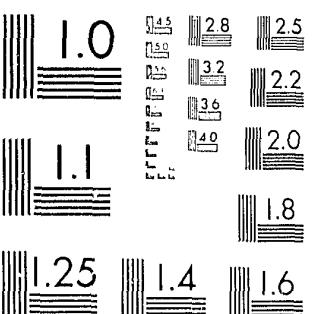


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STUDY OF DEVIANT BEHAVIOR

by

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RESPONDENT LOSS IN THE LONGITUDINAL STUDY OF DEVIANT BEHAVIOR

Statement of Problem

As longitudinal research becomes more popular in the study of deviant behavior, it becomes more urgent that the variety of methodological issues raised by the introduction of time be addressed. One such is the problem of respondent loss. If the loss of respondents can produce what one analyst calls "devastating" results in ordinary, one-wave survey research, such loss may be potentially even more damaging in longitudinal investigations. The basic problem can be simply and directly expressed: the weight of available evidence suggests that such loss is non-random. There is every reason to anticipate, on the basis of both data and common sense, that among other factors that can be expected to be related to respondent loss is the deviant behavior itself. The extent to which loss and deviance over time are interrelated, thus creating a variety of potential confounding effects, when deviance poses the major focus of research, raises important issues to be identified, studied, and resolved.

Some Definitions

There are a variety of research designs which attempt to introduce, in one way or another, a time dimension into the investigation. The focus of the present paper is on longitudinal analysis which can be distinguished from other forms of design in that it follows over

time the same group of individuals, the resulting repeated observations producing information "...about a particular cohort or population at more than one point in time." (Eckland, 1968, p. 51)

A useful distinction has been suggested among two basic kinds of longitudinal surveys: the panel and the follow-up. Typically, a panel study is one in which an initial sample is selected, and then these individuals are followed in waves of repeated interviews or observations into the future. The follow-up uses past records on individuals, such as those available in schools, health departments or hospitals, or prisons, as the initial point of contact, followed by additional data gathering so that patterns of individual change and development can be reconstructed. (Eckland, 1968, p. 52, suggests this usage). The defining characteristic of both is that the same cohort or group of persons are followed over time so that the patterns of individual change can be identified.

There is some possibility for confusion at this point because of the increased popularity, especially in demography, of a closely related form of design which is conventionally called "cohort analysis". Longitudinal surveys may involve what are cohorts, i.e., a group of individuals who "...share the same life event within a given period of time." (Glenn, 1977, p. 8) In demographic research this same "life event" is likely to be date of birth (producing, thereby, the term "birth cohort"), whereas in research of deviance the event may be based on such additional features as school grade or institutional release date.

What separates cohort analysis from longitudinal analysis is that cohort analyses focus on change in aggregate characteristics of the cohort over time, but do not address issues of individual change (Glenn, 1977, pp. 8-10). Thus, the year-by-year change in the delinquency rate of the cohort of males born in 1945 might be traced (with these year-by-year levels perhaps being correlated with such other aggregate phenomena such as employment rates), but since the design does not call for repeated observations of the same individuals, the questions of persistence or change of individual careers of deviance or conventionality cannot be examined. By definition, the issue of loss over time of respondents in longitudinal studies which poses such potential difficulties in tracing patterns of individual change take quite different form in cohort analysis. Certainly, the basic problem of tracing individuals during the course of an investigation (thus raising the possibility of loss) found in panel or follow-up studies vanishes in cohort analysis.

To be sure, the question of cohort "attrition" due to such factors as death and migration are likely to be addressed in cohort analysis (for example, see Glenn, 1977, pp. 12 and 13), but this discussion takes a different form, typically not being defined as a question of respondent loss and consequent bias, and, again, by definition not being concerned with the potential confounding effects of loss over time and change over time in key causal variables.

The final set of terms concerns specifically the question of loss. In research over time, there are two major forms of loss to

be addressed. First, there is the potential of initial respondent loss at the first wave of observation, which can occur when it is not possible to identify, locate, or involve potential respondents at the start of the longitudinal investigation. At this point, the loss question is logically the same as faced by any investigator carrying out a one wave sample survey. Longitudinal respondent loss (referred to often in panel studies as "panel mortality") occurs when individuals initially identified and involved in the first wave become unavailable in later waves or stages of the research process. The problem of the present investigation is to provide some assessment of both the extent to which longitudinal respondent loss occurs, and to the effects this may have on the study of deviant behavior over time.

#### The Level of Loss

How much loss can be anticipated in longitudinal research? The level of loss encountered in the literature varies considerably. Eckland (1968), in his discussion of procedures for retrieving "mobile cases", reviews a group of ten studies, most of whom by aggressively taking on the issue of loss were able to hold the loss rate to below ten percent, even when the time period involved ten years or more. In more routine examples, taking a group of a dozen what appear to be typical studies (see Figure 1), loss rates can be expected to vary from a fraction of a percentage point to over half of the original sample. Many factors seem to contribute to either low or high response rates. One obvious factor is the length of the

Figure 1. Analysis of Loss in Selected Longitudinal Studies

Authors	Type of Study	Focus	General Characteristics of Respondents	Type of Follow-up	Length of Follow-up	Total Initial Population	Remainders	Loss Level
Beilin and Werner (1957)	Two-wave Panel	Study of prediction of "adjustment"	A group of 18-25 year olds from rural Minnesota county	Interview	4-6 years	205 males 143 females	76 66	63.0 % 54.0 %
Edgerton, et. al. (1947)	Four-wave Panel	Study of differential loss in questionnaire study	U.S. high school seniors taking national science TAT in 1942	Questionnaire	3 years	2,460	1,448	41.9 %
Ellis, Endo, Armer (1970)	Two-wave Panel	Study of non-response bias	Entering freshmen University of Oregon	Questionnaire	8 weeks	412	393	4.6 %
Elliott and Voss (1974)	Four-wave Panel	Delinquency and drop-out	High school students in Calif.	Questionnaire	3 years	2,617	235	9.0 %
Lefkowitz, et. al. (1977)	Two-wave Panel	Longitudinal study of development of aggression	Cohort of third grade children in Columbia County, N.Y.	Interview	10 years	875	427	50.5 %
McCord (1978)	Two-wave Panel (First wave from experimental design)	Follow-up of effects of delinquency treatment program	Group of "difficult" and "average" boys in Cambridge-Somerville who were part of experiment	Located Official Records Questionnaire: Controls Questionnaire: Experimentals	30 years	506 253 253	480 122 113	5.0 % .0 % 40.0 % 46.0 %
Rehberg and Rosenthal (1978)	Four-wave Panel	Educational achievement patterns	High school students in seven school districts	Mailed Questionnaire (Wave 4)	4 years	2,788	2,463	12.0 %

Figure 1 (continued)

Sewell and Hauser (1977)	Two-wave Panel	Educational and occupational achievement patterns	Cohort of high school seniors in Wisconsin	Mailed Questionnaire (telephone follow-up)	7 years	4,994	4,388	12.2 %
Sobol (1959)	Five-wave Panel	Consumer behavior	Probability sample of urban population of U.S.	Interviews	3 years	1,153	707	38.7 %
Trent and Medker (1968)	Multi-wave Panel	Post-high school achievement patterns	High school graduates in California	Mailed Questionnaire	4 years	10,755	4,673	43.5 %
West and Farrington	Two-wave Panel	Study of Delinquency	Group of males, age 8, at Wave I in Great Britain	Interviews	10 years	411	389	5.4 %
Wolfgang, Figlio and Sellin (1972)	Multi-wave Follow-up	Delinquency in a birth cohort	Cohort of males born in 1945 residing in Philadelphia between ages 10 and 18	Search of official records	(age 10-18)	14,313	31	0.2 %

follow-up, with the highest loss rates tending to be found in the longer follow-up studies. But, since some instances of low attrition are found in follow-up periods as long as ten years, other factors are at work as well. One can be considered the issue of accessibility. Where data are drawn from official files and records (as is the case with Wolfgang, Figlio, and Sellin, 1972, and with some of the more interesting data reported by McCord, 1978), or where the population is relatively stable either by virtue of culture/geography (as is the case with West and Farrington, 1977) or by location in an educational context (Elliott and Voss, 1974), lower levels of loss are achievable. As Eckland (1968), and Clarridge, Sheehy, and Hauser (1978) demonstrate, however, another issue is the concern given to the problem of loss. Where the investigator gives attention to the problem, where resources are available, and where reasonable techniques of following are utilized, it seems clear that response rates can be held at around the ten percent level or less even when the follow-up period covers several years.

In any case, assuming that the group of longitudinal studies shown in Figure 1 can be considered typical, and since in these, eight of the twelve have loss rates of greater than ten percent, and since six of them display loss involving well over one-third of the initial respondents, the issue of loss is one that would appear to warrant further attention.

#### The Problem of Loss

Taken by itself, this loss of respondents in longitudinal surveys might not pose problems if the loss could be assumed to be random. If those cases that remain are representative of the total initial group, then regardless even of the size of the loss, for most purposes the remaining cases would provide useful and accurate information of the variables under study. Putting it another way, if the loss were random then the distribution of any given set of characteristics would be the same for the three relevant populations, (the initial total population, the panel remainers and the panel losses). Therefore, known characteristics from any one would produce within random error estimates of the other population. Unfortunately, these lost cases, and distribution of characteristics in this population, cannot be assumed to be randomly distributed. If the assumption of randomness must be rejected, there are two distinct and separate issues that can be raised. First, there is what can be identified as the estimation problem. Here the question concerns the extent to which data from individuals who remain available over time are systematically biased in terms of their ability to provide estimates of attributes or characteristics of the total initial population from which the sample was drawn. Second, there is the causal confounding problem, with the determination of causal inferences among central analytic variables of the investigation. That is, to what extent are the data regarding relationships between variables in the remaining population representative of what can be anticipated in the total initial population?

Concerning the estimation problem, there has accumulated over recent years considerable evidence about the biases connected with initial respondent loss in one-wave sample survey research, where loss has been found to be correlated with such factors as social class background, educational attainment, age, minority status, and other characteristics (Stanton, 1939; Suchman and McCandless, 1940; Reuss, 1943; Benson, 1946; Edgerton et al., 1947; Wallace, 1954; Ellis et al., 1970 in Pavalko and Lutterman, 1973, p. 464).

With regard to longitudinal studies, there, also, findings have been produced which indicate differences between those who remain in longitudinal studies and those who are lost. In a panel study of a cohort of late adolescents, Sewell and Hauser (1977) report that their panel remainers would provide biased estimates of characteristics of the total initial population in that, when contrasted with panel losses, the remainers were likely to experience higher levels of school achievement, more likely to come from higher social class origins, and were likely to show higher levels of educational and occupational aspirations. Somewhat similar patterns have been found in other educational cohorts, although two studies indicate that remainers are biased primarily in school related behavior such as achievement, curriculum location, and future aspirations, rather than in family background characteristics such as social class (Trent and Medsker, 1968, and Rehberg and Rosenthal, 1978).

In a panel study which examined a cohort of individuals entering one university, Ellis, Endo and Armer (1970) make some

significant observations about the potential link between loss and future behavior.

What these writers observed was that while there were some small differences between panel remainers and losses in the "backgrounds" that the young persons brought into the situation (the most consistent differences being in educational behavior such as prior academic achievement), these background differences were small when compared to the differences noted in their future behavior. For example, virtually three out of four of the panel losses had failed in their first year of university work, contrasted with one in four of the panel remainers. Similarly, not one of the panel losses had graduated after five years, compared with just over one-third of the remainers.

What the weight of this evidence suggests is that the great probability is that, with respect to the issue of estimation, biasing effects can be anticipated as a consequence of the loss of respondents in longitudinal studies. Further, the direction of this bias can be anticipated to flow along dimensions of social vulnerability, i.e., losses are more likely to be those who are at some form of social or institutional disadvantage.

However important such biases may be, there is another issue that is of much greater significance to most tasks of research analysis. In most investigations the concern is with tracing relationships among variables. The problem of loss here becomes a bit more complicated, since the question then becomes: to what extent are estimates of relationships between variables biased as a consequence

of loss? What Suchman (1962) suggests is that although loss due to non-response may throw off estimates of important characteristics of the total population, this loss does not necessarily disturb the analysis of relationships among variables. Similarly, Sewell and Hauser (1977) after carrying out bivariate, multivariate, and inter-correlational analyses among remainers, losses, and the initial total population in their panel study, conclude, that although there are, indeed, some minor but clear problems of parameter estimation, there is little chance that the pattern of relationships observed in the remainers would produce conclusions in any significant way different from the initial total sample. Putting it another way, the data from the remainers appears to provide relatively unbiased estimates of important bivariate and multivariate relationships among key study variables.

#### Loss and Deviance

The problem of the present paper focuses on the possible confounding effects of loss and deviance in longitudinal studies. The general evidence from other longitudinal research suggests that involved in loss are patterns of social vulnerability. For example, a persistent observation in educational cohort studies is that losses are more likely to show low levels of educational attainment, are less likely to have high levels of educational and occupational aspirations. Studies of school behavior and delinquency, of course, suggest that there are relatively high correlations between these behaviors and delinquency. (Polk and Schafer, 1972) That is, on the

basis of indirect implications, there are good reasons to expect that panel loss and the deviant behavior will be correlated. Unfortunately, the matter has not been treated extensively in existing longitudinal studies of deviance, partly because in some the loss rate has been so low that the problem is passed over since the loss could have little effect on the conclusions (as is true, for example, in the investigations of West and Farrington, 1977, and Wolfgang, Figlio, and Sellin, 1972). Where evidence does exist, there is every indication that at least some correlation between loss and deviance is found. In the investigation of Lefkowitz and his associates (1977), for one illustration, almost double the number of low-aggressive subjects in contrast with the high-aggressive subjects were available for reinterview in the follow-up wave. Elliott and Voss report that in their multiple wave panel study, that while there seem to be no systematic pattern of bias among remainers and losses in terms of the important dimensions of class and ethnicity, the lost cases were more likely to be male and to show "significantly higher initial involvement in delinquent activities." (1972, p. 52)

Both the indirect and the direct evidence, in other words, suggest that there may be in longitudinal studies of deviant behavior a confounding of loss and deviance. It seems reasonable to expect that data from remainers will provide in significant ways underestimates of the level of deviant behavior in the total group. Further information is needed to establish whether this estimation

bias is strong enough to influence patterns of causal relationships and interpretations thereof.

#### The Data for This Investigation

In order to explore in more detail the topic of the impact of respondent loss in longitudinal studies of deviant behavior, data will be derived from two fundamentally different types of longitudinal studies. One is a multi-wave panel investigation of a cohort of male youth drawn from a small county in the Pacific Northwest, the Marion County Youth Study (MCYS). The other is a follow-up study of parolees based on official data derived from records of state paroling agencies which are collected and analyzed by the staff of the Uniform Parole Reports (UPR) conducted by the National Council on Crime and Delinquency.

The Marion County Youth Study is an on-going panel investigation of a cohort of males drawn from a county in the state of Oregon. The investigation was begun in 1964 when a questionnaire was submitted to all males ( $N=1,224$ ) enrolled in Grade 10 of the high schools in the county. In 1967 a 25 percent random sample ( $N=309$ ) was selected for reinterview, and then from that time to the present for virtually every year, an additional wave of data has been gathered through the use of mailed questionnaires. By Wave 10 in 1975, the cutoff date for this study, a total of 257 of the original 309 remained in the study. Among the losses, totalling 52 (13.6%), the largest group, 25 (8.1%), were incurred in the first year of interviewing, the loss seemingly to be a result of the necessary

but involved procedures of obtaining signed informed consent statements from both the respondent and his parents since at that time the group was under the age of 18. Since that time, the average annual loss rate has run under one percent.

The second source of data for this investigation is provided by a follow-up study of individuals placed on parole known as the Uniform Parole Reports (UPR). In order to determine the nature of parole outcomes, UPR has been tracing over time annually groups of individuals placed on parole. A one year follow-up reporting system was first established in 1967. Beginning with 1968, two year outcome data were also collected, and a three year follow-up began in 1969. Since 1969, parole outcome data have been collected on individual parolees at 12, 24, and 36 months from the date of release. The procedure followed is that each month lists of persons released to parole from the states are sent by cooperating jurisdictions to UPR offices maintained by the National Council on Crime and Delinquency. At 12, 24, and 36 months from the date of release to parole, UPR staff send code sheets to the appropriate agencies soliciting information on individual parolees. The data for the present investigation are drawn from the three year follow-up of the group placed on parole during the year 1973 (and therefore followed through 1976). A total of 21,155 individuals placed on parole in 1973 were followed in 32 cooperating jurisdictions through the three year follow-up period. Of this group, records were not obtainable, i.e., the cases were "lost", for a total of

97 between years one and two, and 167 cases between years two and three, for a total group of losses of 264, producing a total rate of lost cases of 1.2 percent.

These two studies, then, represent distinct types of longitudinal studies. The Marion County study is a classic, multi-wave panel study with extensive data gathered at each wave directly from the respondent, therefore requiring cooperation from actual respondents in order to maintain a low level of loss. The UPR investigation is a classic follow-up study, with official records providing the basic data source, with the loss level then being a function of the nature of the record keeping maintained by the paroling jurisdiction. The two individually and in comparison, should shed some light on questions of loss that can be anticipated in longitudinal research on deviance.

#### Loss and Estimation Bias

Evidence from both of these data sets indicates that losses in studies of deviance do differ from remainers in critical areas that bear both indirectly and directly on these topics of deviance. In the Marion County investigation, the evidence on school vulnerability seem to be especially systematic and patterned. Panel losses, in contrast to remainers, are more likely to be doing poorly in school (56 vs. 26 percent receiving grades below the "C" level), are less likely to plan to go to college (33 vs. 47 percent indicating that they "want to go and plan to go to college"), are less likely to be involved in school activities (44 vs. 30 percent indicating that they have no involvement in school activities), and are ultimately less likely to finish high school (63 vs. 88 percent graduating with their class in June, 1967). Concerning specifically the issue of deviant behavior, panel losses, as expected were not only more likely to be delinquent during the adolescent period (26 vs. 14 percent being referred at some point for delinquency), they were also as adults (i.e., after the age of 18) more likely to have an official police record of some form of criminal offense (26 vs. 14 percent with such records).

While the data are neither as extensive nor as patterned, evidence from the UPR group also shows potential problematic biases among the study losses. While losses are only minimally different from remainers with respect to age and sex, there do appear to be important differences with respect to time served and type of offense.

A greater proportion of the remainders (66.0 percent) were likely to have served less than two years in comparison to the early (60.8 percent) and late (47.3 percent) losses. Further, the remainders were less likely (32.2 percent to be sentenced for serious assault offenses (compared with 41.2 percent of the early losses and 41.9 percent of the late losses), but more likely to be sentenced (38.0 percent) for serious property offenses (compared with 29.9 percent of the early losses, and 29.3 percent of the late losses). There appeared to be no significant variation in the UPR group on the dimension of parole violation, and an inconsistency with respect to the number of prior sentences, with the early losses being more likely than the remainders to have no prior sentences, but the late losses being less likely.

The evidence from these two different investigations lead to the same conclusion: there is, in fact, systematic bias in the population that remains a longitudinal investigation. The deviant behavior is, as expected, correlated with the phenomenon of loss.

#### Loss and Causal Confounding

As suggested earlier, the major issue that faces most investigation as a consequence of loss is not so much the simple estimation problem, but the way that loss might interfere with the study of significant relationships among study variables. While there are a variety of ways of examining this question, what we shall do here is to examine for both sets of data the pattern of inter-correlation available from Time I data between key variables for the

three relevant populations: the remainder, the losses, and the total initial population.

The analysis here can proceed in two steps. First, it is possible to examine, for both the MCYS and the UPR studies, the comparability of the matrix of intercorrelations for the remainders and the losses. In the UPR case, the results are clear: the two matrices are virtually identical, yielding the same conclusions regarding the interrelationships among these variables. In the MCYS that pattern is not quite as consistent, but the conclusions are roughly the same. In only three of the fifteen intercorrelations is there a possibility of assuming a significant relationship in the remainders where no relationship exists among the losses. Since there does not appear to be a ready explanation for why these three are different, and since the overall pattern is one of consistency, it would seem reasonable to conclude that the general conclusion of similarity of the matrices is warranted.

It should be obvious, however, that the basic issue of confounding is resolved by another comparison. It is in the contrast of the differences between the correlations in the initial total population and in the remainder population that the issue of confounding bias is established. That is, given that by definition what exists for most variables is information on the remainders, the question then becomes to what extent this population provides adequate estimates of the total population from which they are derived. In both the UPR and the MCYS the results here are the same:

the matrices of intercorrelations is virtually identical between remainers and the total sample. Putting the matter in another way, if one had access only to the correlations between variables among the remainers, reasonable estimates could be made of the correlations to be expected in the total initial population.

#### Discussion

Clearly, in longitudinal studies of deviant behavior the issue of loss of respondents merits attention, as a consequence of the empirical fact that loss and deviance are correlated. Where the loss runs as high as fifty percent, as it does in some investigations, and where the deviant populations are highly concentrated in the lost populations, then generalizability may be seriously threatened. In any case, where a major task of the research is to provide reasonable univariate population estimates of population parameters dealing with deviance, problems posed by the loss of respondents must be brought under control.

One obvious tactic is to reduce loss to a minimum. Several recent writings have given specific attention to the nature of loss in longitudinal studies, and how this loss can be reduced to inconsequential levels (for example, see Eckland, 1968; and Clarridge, Sheehy, and Hauser, 1978). Such investigations suggest a number of devices in the research process both for accurate recording of initial tracing information (what Eckland calls "anchor points") at Time I, and for resources available in the search

for loss cases. A variable emerges here that might be called interest/disinterest. A finding that comes out of consumer panel research is that it is the interested respondents that tend to remain in panels (Sobol, 1959). And, turning it around, there are some individuals who are markedly disinterested in being traced.

As one study notes:

We sometimes discovered that people did not want to be found. Some owed money for child support and others moved frequently, leaving a trail of unpaid bills. Sometimes the parents or spouse would refuse to give us information because they wanted to protect the respondent from harassment or because the respondent had a serious problem such as alcohol addiction or mental illness. It was seldom possible to locate and interview such a respondent (Clarridge, Sheehy, and Hauser, 1978, p. 196).

Given this dimension, procedures can be developed which on the one hand increase an individual's interest in the research, (including consideration of paying the respondent) especially for research involving mailed questionnaires. On the other hand, procedures can be developed which deal directly with the elimination of any perceived threat on the part of the respondent, through such things as assurances of anonymity.

In any case, the ultimate problem of estimation error lies in the combination of the size of the loss and the correlation of loss with other attributes, including deviance. The manipulable part of this equation is size of loss and if that can be brought under control, and if it can be established that the correlations between loss and other variables is small, then the investigator may feel

reasonably confident that the population estimates, while systematically biased, are not greatly affected.

Before one settles into a mood of confidence, however, other dangers need to be pointed out. One is that virtually all the research which suggests that the impact of loss may be minimal derives this conclusion from the examination of Time 1 data. A carefully conceived panel study is such that in the initial wave considerable data are amassed on respondents, these data providing the basis for a comparison of those who are lost or who remain in the later waves of data collection. From such data, a variety of intensive and detailed comparisons can be made on the basis of the Time 1 observations between remainers and losses. It may be, however, that the differences between the losses and remainers become more extreme over time, and this is precisely what Ellis, Endo, and Armer report. That is, there is a problem of the emergence of future differences among lost populations that is, literally, not readily resolvable using standard techniques of past data comparisons. One strong possibility to be considered here is the inclusion in the data collection over time of sources of official data which remain accessible for lost as well as remainder populations (such as the school records used by the Ellis, Endo, and Armer study, or the police records used in the Wolfgang and MCYS investigations).

A second warning derives from the fact that there are different kinds of losses. Sobol (1959), for example, found that "movers not followed" and "refusals" constituted two different, and confounding

elements of the panel loss population, with the movers more likely to be younger, renters as opposed to home-owners, and of low income. In an educational cohort, Pavalko and Luterman found that the refusal population was less likely to be doing well in school or have college plans than was the case of the "never contacted" group within the lost population.

In the Marion County data, there is good evidence that time and loss characteristics interact. Among the group of individuals who were lost early in the study, at Wave II, we find that the pattern of school vulnerability is especially strong, with this early loss group much less likely than either remainers or later losses to be doing well in school, to have college plans, or in fact to even graduate from high school. At the same time, after the adolescent years, this group seems to "taper off" in terms of difficulties, and the level of adult criminality is actually lower than that for the panel remainers.

The late losses (after Wave II), show quite a different pattern. While they are somewhat more vulnerable in terms of the Time I educational measures than is the case for the panel remainers, the differences that are especially pronounced lie in the area of deviance, especially later deviance. While only 14 percent of the remainers had adult records (and but 12 percent of the early losses), fully forty percent of the late losses accumulated some form of contact with police as adults.

What the trend of such data suggest is that there are differential variations that can exist in the total group of panel losses, and that these variations are interactive with other variables, and with time. Different types of losses pose different problems at different points in the research process. It may be that if loss constitutes but a tiny fraction of the total study population, that it is neither feasible nor desirable to trace such differences. There is every reason to believe, however, that as the study proceeds there will be a group within the cohort population that develops stronger and stronger reasons not to be followed. In studies of deviant behavior, it may be critical to do everything possible to bring the potential effects of these what might be called "emergent losses" under control.

#### Conclusions

This investigation is aimed at exploring the implications of respondent loss in longitudinal studies of deviant behavior. Evidence from the two study populations here, as well as the weight of evidence from other research, does suggest that loss is, in fact, correlated with deviance. Both delinquency and criminality are correlated with respondent loss.

This loss can be broken down into two possible confounding effects. The first issue concerns that of estimation of univariate population characteristics from the group of study remainders. Since it is clear that those who remain provide biased estimates of total population characteristics, then where issues of such estimation are raised in an investigation (such as the question of how much delinquency or crime exists in the population) then some attention should be given to the issue of respondent

loss. At the same time, it can be stated that in most instances, while bias is systematic, it is also relatively small. In the UPR data, for example, estimation of total population characteristics from the remainder sample would create error which in no case exceeds a tenth of a percent (this being a result of a combination of a relatively small loss population). In the MCYS sample, the largest difference observed between the remainder and the total initial population is five percent. In both studies, in other words, the difference between the total and remainders groups are small enough so that the remainders data can provide reasonable rough guesses as to what is happening in the total population. What this means, of course, is that while loss is correlated with certain attributes, and while these correlations are systematic, they are not overwhelmingly strong. Delinquency is somewhat higher in the loss group, but only somewhat. A great majority of the delinquent population survive in the remainders group, so that it cannot be said either that a preponderance of the delinquents are lost, or even that the majority of the lost population are in the deviant category. The vulnerability bias is systematic (and therefore must be considered if one wishes to make accurate estimates of population parameters) but slight.

Also, it can be noted that since the general pattern is consistent with the vulnerability hypothesis, the remainders group will by and large provide conservative estimates of parameters of deviance. The analyst who observes a certain level of deviance in a remainder group in a longitudinal study can be confident, on the basis of the patterns observed here and elsewhere, that at least that level of deviance exists in the

total population under study. That is, the directionality of the relationship between loss and deviance expressed in the hypothesis of vulnerability, is such that the remainder data provide systematic and generally slight underestimates of population parameters of deviance.

When we turn to the major issue of the implications of loss on the study of causal relationships in an investigation, we are on apparently firmer ground. In both of the study populations used in the present research, the pattern of bivariate relationships among the remainders was virtually identical to that of the total population, confirming a finding reported in an earlier study by Sewell and Hauser (1975).

Since the major task of most social scientific investigations is to study patterns of interrelationships, this finding is a major one. Simple regression theory explains the result. For an outside variable to "confound" an original relationship, that variable must be highly correlated with both the independent and the dependent variable. Assuming here that the measure of deviant behavior constitutes the dependent variable, what the data on estimation indicate are that while the correlations of loss with deviance are systematic, these are also very weak. Since the correlations of loss with the known independent variables are also weak, the basic conditions whereby loss would confound the analysis (i.e., a strong correlation of loss with both independent and dependent variables) do not obtain. The finding of virtually identical patterns of correlation obtains for both of the present studies, as well as that of Sewell and Hauser (1975) suggests that for such populations, as

long as loss is relatively small, the investigators may reasonably expect little impact of loss on this important task of tracing causal patterns.

One caution, however, must be repeated. Losses generally, and especially later losses, in multi-wave longitudinal studies may differ significantly on "emergent," future variables. Most studies of loss, including the present one, base much of their analysis on time one data. By definition, future differentials between losses and remainders which might emerge cannot be analyzed. Nonetheless, the general conclusion from the present study, and literature review, is that with reasonable care and attention, researchers studying deviant behavior in longitudinal contexts should be able to bring the problem of loss under control.

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Table 1: Comparison of Percentage Responses of the Initial Total Random Sample (Wave I), the Panel Remainers, and the Panel Losses on Selected Demographic and Behavioral Items, Marion County Youth Study

## APPENDIX

Variable	Total Random Sample (N=309)	Panel Remainers (N=257)	Panel Losses (N=52)
Percent with White Collar Father (Wave I)	35	35	43
Percent Planning College (Wave I)	44	47	33
Percent with No Club or Activity Involvement (Wave I)	32	30	44
Percent with G.P.A. Below 2.00 (School Records)	31	26	56
Percent Graduated with Class (School Records)	83	88	63
Percent Delinquent as Adolescent (Court Records)	23	21	31
Percent Criminal as Adults (Police Records)	16	14	26

**Table 2. Comparison of Percentage Distribution of Total Initial Population, Follow-up Remainders, and Follow-up Losses, on Selected Demographic and Criminal History Variables, Uniform Parole Reports Data**

Variable	Total Initial Population (N=21,155)	Follow-up Remainders (N=20,891)	Early Follow-up Losses (N=97)	Late Follow-up Losses (N=167)
Percentage Male	95.6	95.6	92.8	94.6
Percentage Under 25	36.2	36.2	35.0	32.3
Percentage "Anglo"	53.1	53.0	47.3	44.7
Percentage with Parole Violations	6.6	6.6	6.2	4.2
Percentage with Serious Assault Offenses	33.3	33.2	41.2	41.9
Percentage with Serious Property Offenses	37.9	38.0	29.9	29.3
Percentage with no Prior Sentence	30.1	30.2	38.1	28.7
Percentage with Serving Less than two year Sentences	65.9	66.0	60.8	47.3

**Table 3. Intercorrelation Matrix (Phi coefficients) of Selected Dichotomized Variables,  
Marion County Youth Study: Total Initial Sample (N=309)**

Variable	1	2	3	4	5	6
1. Father's Social Class	1.00	.05	.28***	.20***	-.16**	.05
2. Peer Conformity Rebellion		1.00	.11*	.25***	-.22***	.20***
3. College Plans			1.00	.15**	-.50***	.07
4. Drinking Behavior				1.00	-.24***	.20***
5. Grade Point Average					1.00	-.19***
6. Official Delinquency						1.00

\*Significant at the .05 level

\*\*Significant at the .01 level

\*\*\*Significant at the .001 level

Table 4. Intercorrelation Matrix (Phi coefficients) of Selected Dichotomized Variables,  
 Marion County Youth Study: Panel Remainders (N=257)

Variable	1	2	3	4	5	6
1. Father's Social Class	1.00	.06	.25***	.17**	-.15*	.02
2. Peer Conformity Rebellion		1.00	.08	.22***	-.21***	.20***
3. College Plans			1.00	.11*	-.47***	.05
4. Drinking Behavior				1.00	-.22***	.18**
5. Grade Point Average					1.00	-.18**
6. Official Delinquency						1.00

\*Significant at the .05 level

\*\*Significant at the .01 level

\*\*\*Significant at the .001 level

Table 5. Intercorrelation Matrix (Phi coefficients) of Selected Dichotomized Variables,  
 Marion County Youth Study: Panel Losses (N=52)

Variable	1	2	3	4	5	6
1. Father's Social Class	1.00	.06	.46**	.31*	-.29*	.22
2. Peer Conformity Rebellion		1.00	.15	.44***	-.08	.10
3. College Plans			1.00	.32*	-.62***	.06
4. Drinking Behavior				1.00	-.35**	.26
5. Grade Point Average					1.00	-.19
6. Official Delinquency						1.00

\*Significant at the .05 level

\*\*Significant at the .01 level

\*\*\*Significant at the .001 level

Table 6. Intercorrelation Matrix of Selected Variables, Uniform Parole Reports, Total Initial Sample (CN=21,155)

Variable	1	2	3	4	5
Type of Commitment	1.00	.06	.08	-.03	.03
Number of Prior Commitments		1.00	.11	.04	.03
Age at Parole Entry			1.00	.03	.38
Sex				1.00	.05
Time Served in Prison					1.00

Table 7. Intercorrelation Matrix of Selected Variables, Uniform Parole Reports, Follow-up Remainders (N=20,891)

Variable	1	2	3	4	5
Type of Commitment	1.00	.06	.08	-.03	.04
Number of Prior Commitments		1.00	.11	-.04	.03
Age at Parole Entry			1.00	.02	.37
Sex				1.00	-.05
Time Served in Prison					1.00

Table 8. Intercorrelation Matrix of Selected Variables, Uniform Parole Reports, Follow-up Losses (N=264)

Variable	1	2	3	4	5
Type of Commitment	1.00	-.01	.13	-.06	-.06
Number of Prior Commitments		1.00	.07	-.04	.05
Age at Parole Entry			1.00	.06	.48
Sex				1.00	-.07
Time Served in Prison					1.00

END