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RESPONSE BIAS IN FOLLOW-UP STUDIES OF COLLEGE STUDENTS

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The problems of response bias in longitudinal studies of college students are examined. An extensive follow-up questionnaire was sent to 1,253 college seniors who had participated in a similar survey as freshman four years earlier. Careful measure of student responsiveness in relation to various techniques designed to increase the proportion of responders (e.g., postcard, telephone contact) were kept.

The less responsive groups were significantly different from their more responsive counterparts on nearly a dozen variables representing a wide variety of content areas, including academic achievement, self-concept, alcohol consumption, social deviance, and major choice preferences. Controlling for sex and socioeconomic status served to reduce, but not eliminate, these biases. Overall, the results indicate that researchers cannot account for follow-up nonresponse bias by making statistical adjustments according to data available at initial testing. The results are discussed in light of identifying the reasons for nonresponse, and attempting to develop categories of nonresponders who may be motivated to cooperate by different types of follow-up techniques.

Key words: response bias; college students; nonresponse; longitudinal; follow-up

One problem with follow-up studies in behavioral research is the difficulty of obtaining data from a high percentage of respondents. This is particularly true for studies using mailed questionnaires. Some researchers have obtained a return rate of 50% or lower, whereas others have worked hard to raise that figure to nearly 90% (Bachman, et al., 1967; Linsky, 1975). Since it is difficult and costly to obtain such a high response rate, the resulting decrease in sample bias must be measured

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against the disadvantage of the extra effort and cost (Cox, 1976; Schewe and Cournoyer, 1976; Wayne, 1976).

Some questions relevant to this issue have been addressed in studies of change among university students. For example, Thistlethwaite and Wheeler (1965) examined initial differences between respondents and nonrespondents in a four-year longitudinal study of college students. They were successful in collecting data from 58% of the target sample during the students' sophomore year and 70% during the senior year. Compared with nonrespondents, the respondents in the sophomore year were more likely to be females and were higher in entering college aptitude (as measured by the National Merit Scholarship Qualifying Test). Senior year respondents were higher than nonrespondents in entering National Merit scores, and in grades and educational aspirations in their sophomore year.

Astin also called attention to problems of nonresponse to questionnaire surveys in educational research. His work shows that students who respond to follow-up surveys, in comparison with those who do not, are brighter, achieve at a higher level, are more motivated, and have more-highly educated parents (Astin, 1970; Astin and Panos, 1969). He concludes that unweighted follow-up scores are likely to be biased with respect to both sociodemographic and student achievement variables.

The above studies indicate that there are sample biases in follow-up questionnaire data with respect to characteristics measured at preceding testing points. However, they provide no evidence concerning the extent of bias in variables evaluated at follow-up. These are the variables which are presumably most important, especially if they are assumed to be affected by influences operating between testings. Since there is no follow-up data for the nonrespondents, there is no basis for comparing them with respondents on these variables.

One way to overcome this difficulty is to examine follow-up studies which have attained relatively high response rates and to compare the early with the late respondents. It is assumed that the late respondents—those requiring more investigator prodding—would have been nonrespondents under conditions of less investigator effort in data collection. Differences between the follow-up scores of early and late respondents indicate the extent of sample bias if the late respondents had not been included.

Mayer and Pratt (1966) analyzed the sociodemographic characteristics of early and late respondents to a mailed survey of automobile accident victims. They found no significant differences between groups on 12 of 14 variables (e.g., age, occupational status, race, and extent of

injury) and thus concluded that there was little systematic bias in the sample of early respondents.

In a follow-up study of treated alcoholics, Moos and Bliss (1978) showed that late respondents did worse than early respondents on seven of nine treatment-related outcomes, including abstinence since discharge from treatment and behavioral impairment due to drinking. These differences persisted even after sociodemographic variables were controlled. They concluded that special effort in collecting follow-up data should be expended to guard against conveying an overly optimistic picture of the results of treatment.

Studies of nonresponse have rarely examined the relationships among variables which distinguish respondents from nonrespondents. Relevant content variables (high school aptitude) may fail to differentiate the two groups once sociodemographic variables (e.g., sex and SES) are controlled. For example, in the work reported by Astin it is not clear how many of the correlates of nonresponse would remain once social background characteristics were controlled (Astin, 1970; Astin and Panos, 1969). This is important when weighting schemes are suggested as a way of reducing sampling bias. If most of the differences between respondents and nonrespondents could be accounted for by a few background variables, simple weighting schemes to reduce sample bias could be devised. If not, weighting schemes could become so complex as to make them impractical.

Finally, since the point of longitudinal research is to measure change, it is important to assess whether there are different patterns of change in easy versus difficult to follow respondents. This question has not been addressed in the nonresponse literature.

Our purpose is to estimate the extent to which nonresponse to a mailed questionnaire may bias findings in developmental studies of college students. Three related questions are addressed. (1) Are students who respond early in a senior year follow-up systematically different from late responders on variables collected at the time of follow-up, i.e., at the end of the senior year? Are any differences between early and late respondents in the senior year independent of sociodemographic variables such as sex and social class? (2) Are there differences between early and late respondents in the direction and extent of change of relevant variables from the freshman to the senior year? (3) Are students who respond in the senior year systematically different from senior year nonrespondents on variables which are collected for both groups at initial testing, i.e., at the beginning of the freshman year? Are any initial differences between senior year respondents and nonrespondents independent of sociodemographic variables?

METHOD

Sample

A follow-up questionnaire (the College Experience Questionnaire) was sent to 1,253 college seniors who had participated in a similar survey as freshmen four years earlier. The College Experience Questionnaire (CEQ) included questions about the students' residence, major plans, plans after graduation, activities in college, self-descriptions, health, drinking, and the purpose of college education. The sample was drawn from two universities: a large state-supported institution in a small rural community, and a smaller church-affiliated university located in a busy urban area. Of the 1,253 students, 1,194 actually received questionnaires (the remaining 59 were unlocatable). Of those who received questionnaires, 1,072 or 90% returned them (DeYoung, 1975; Moos, DeYoung, and Van Dort, 1976).

Measures of Student Responsiveness

A record was kept indicating the point at which each of the 1,072 students returned the senior year questionnaire. The 52% who returned the CEQ within two weeks of the first mailing were given a code of "1" in responsiveness. A code of "2" was given to the 18% who required a postcard reminder before returning the questionnaire. A code of "3" was given to the 4% who returned the questionnaire after a postcard reminder and subsequent telephone contact. A code of "4" was given to the 10% who responded after having received a postcard reminder and a second questionnaire, and a code of "5" was given to the last 3% who responded only after receiving a third questionnaire. It was not possible to ascertain the level of effort expended for 38 students (3%), either because the questionnaires were returned anonymously or because it was unclear which follow-up effort had motivated the return.

In sum, 1,034 (87%) of the 1,194 questionnaire actually delivered were returned and classifiable at a level of student responsiveness. Those who responded after receiving the first questionnaire plus 0 to 2 follow-up contacts (74%) were labeled early respondents, while those who responded only after receiving a second or third questionnaire (13%) were labeled late respondents. These two groups were compared on senior year variables.

Correlates of Student Responsiveness

Respondents and nonrespondents could be compared on almost any variable. One way to narrow the choice to a manageable number is to

consider variables of particular interest in studies of college student change. Following this logic, we consulted Feldman and Newcomb's (1969) *The Impact of College on Students,* which lists 19 topics of current interest in studies of college impact. The CEQ allowed us to investigate variables in the following ten of these categories: (1) *The purpose of college education* (senior survey only)—student-rated importance of seven purposes, such as to develop morals and values and to develop skills which will earn a high income. (2) *Quality of instruction and satisfaction with courses and teachers* (senior survey only)—students' rated eleven variables assessing the climate of their major department (e.g., encouraged students to become involved in their work, helped and supported students, provided opportunities for social interaction), and seven variables assessing their satisfaction with their department (e.g., professors' knowledge of their field, professors' teaching abilities). (3) *Major choice* was categorized into six types, such as biology/physical sciences and art/music/literature, according to Holland's (1973) theory (Hearn and Moos, 1978). (4) *Need for achievement* included grade point average, educational aspirations, and a motivation scale consisting of adjectives such as ambitious, dominant, and energetic. (5) *Students' self-concepts* was composed of self-descriptive adjectives such as calm, cautious, cooperative, and easy-going. (6) *Intellectual orientation* was measured by the self-descriptive adjective, intellectual. (7) *Religious orientation* was a scale assessing participation in activities such as praying and reading the Bible.

(8) *Sociability and friendliness* included two scales: a dating scale assessing activities such as how often students arranged a date for another student, and a friendship scale assessing activities such as how often students discussed personal problems with friends. (9) *Readiness to express impulses* was composed of the self-concept variable, rebellious, and a deviancy scale, assessing activities such as "broke school rules without getting caught." (10) *Psychological well-being* included a physical symptoms scale, assessing symptoms such as loss of appetite and upset stomach, and a moodiness cale, assessing how often students experienced moods such as loneliness and boredom.

In addition to the above, two other relevant topics were assessed by the CEQ—namely, (11) *Student drinking* was measured by the frequency of drinking beer, wine, and hard liquor, and (12) *Athletic participation* was composed of a scale combining items such as participation in intercollegiate sports and participation in athletics.

Sociodemographic Variables

The sociodemographic variables to be controlled are student sex and parental socioeconomic status. Parental socioeconomic status was

operationalized in the senior year analysis by using the occupational status of the head of the household from which the student came. In most cases (94%) this meant using the father's occupational status; in the remainder the mother's. Parental occupations were ranked according to the Hollingshead seven-step occupational scale (Hollingshead, 1957). For the freshman year analysis parental SES was operationalized through the use of a seven-point education measure for both parents, as information concerning parental occupation was not available. Education and occupational status were highly intercorrelated ($r = .58$) in the subsample of students for which we had both measures.

Statistical Procedures

Differences between groups were assessed by comparing mean scores, and analysis of variance was used to test for statistical significance. Sex and SES were controlled as follows: SES was entered first as a covariate and then sex was entered as a second factor in a two-way analysis of covariance. For some topics, there were no variables which differentiated the two response groups. These topics do not appear in the tables.

RESULTS

Early Versus Late Respondents

Table 1 shows the results of the comparison of the early and late respondents. Compared to the early respondents, those late in responding characterized themselves as more rebellious, more deviant, more athletic, more frequent beer drinkers, more active in dating, and more interested in developing morals and values. They also saw themselves as less cooperative and less intellectual, and had a lower grade point average than the early respondents. In the area of major choice, the late respondents were more likely to be identified with engineering, administration, and political science majors.

Sex significantly differentiated the early from the late respondents, but SES did not. Females made up 54% of the early respondents, but only 38% of the late. When introduced as controls sex and SES eliminated only four of the eleven variables which discriminated between the response groups—namely, intellectual self-concept, beer drinking, and major choice (see Table 2). Sex was most influential in attenuating the between-group differences in beer drinking and college major choice, while SES was more important with respect to intellectual self-concept.

We also investigated the question of differential rates of change for

TABLE 1. Means and Standard Deviations of Senior-Year Variables for Early and Late Respondents

Variables+	Early Respondents (N = 882) $\bar{X}$	Early Respondents (N = 882) S.D.	Late Respondents (N = 152) $\bar{X}$	Late Respondents (N = 152) S.D.	F DF = (1,1032)
Purpose of College Education					
Vocational training	3.10	0.86	3.08	0.83	0.06
Getting along with people	3.40	0.71	3.53	0.72	3.05
Understanding world problems	3.20	0.80	3.13	0.85	0.84
Developing morals and values	2.56	0.98	2.77	0.93	7.62**
Prepare for happy marriage	1.93	0.83	1.92	0.82	0.00
Earn a high income	2.48	0.82	2.56	0.89	1.48
Understanding science	2.94	0.82	2.89	0.92	0.29
Understanding human behavior	3.18	0.75	3.29	0.66	2.52
Understanding arts	2.86	0.82	2.95	0.79	1.41
Major choice					
Engineering	0.05	0.22	0.09	0.29	4.00*
Biology/physical science	0.34	0.48	0.33	0.47	0.07
Education/social science	0.22	0.42	0.19	0.40	0.51
Business/economics	0.01	0.01	0.03	0.03	2.46
Administration/political science	0.09	0.28	0.14	0.35	3.82*
Art/music/literature	0.12	0.32	0.12	0.32	0.00

TABLE 1 *(Continued)*

Variables[+]	Early Respondents (N = 882) $\bar{X}$	Early Respondents (N = 882) S.D.	Late Respondents (N = 152) $\bar{X}$	Late Respondents (N = 152) S.D.	F DF = (1,1032)
Need for Achievement					
Overall GPA	3.00	0.88	2.90	0.85	4.49*
Educational aspirations	2.08	0.73	2.15	0.77	0.94
Motivation	2.92	0.53	2.91	0.53	0.03
Self-Concepts					
Calm	2.80	0.80	2.76	0.85	0.37
Cautious	2.87	0.77	2.76	0.84	2.53
Cooperative	3.33	0.66	3.16	0.65	8.76**
Easy-going	3.04	0.78	3.03	0.83	0.02
Happy	3.21	0.71	3.14	0.74	1.13
Idealistic	2.88	0.88	2.83	0.95	0.39
Outgoing	2.84	0.90	2.90	0.85	0.66
Poised	2.67	0.81	2.73	0.81	0.74

Intellectual Orientation					
Intellectual	2.90	0.76	2.76	0.78	4.39*
Sociability					
Dating scale	1.81	0.42	1.95	0.50	14.16***
Friendship scale	3.14	0.54	2.07	0.55	0.03
Impulse Expression					
Rebellious	1.91	0.80	2.06	0.84	4.48*
Deviancy scale	1.82	0.51	2.07	0.59	28.27***
Alcohol Consumption					
Beer drinking	1.46	1.07	1.67	1.24	4.91*
Wine drinking	2.17	0.73	2.18	0.77	0.00
Hard liquor drinking	2.08	0.76	2.10	0.79	0.00
Athletic Participation					
Athletic scale	2.88	0.89	3.10	0.91	7.54**

[+]All variables are measured on a 4-point scale (with 4 high and 1 low), beer drinking (5 points), educational aspirations (3 points), major choice (dummy variables).
*$p \leq .05$ **$p \leq .01$ ***$p \leq .001$

TABLE 2. Mean scores on initially differentiating senior year variables for early and late respondents after controlling for sex and parental SES

Variables	Early Respondents (N = 882)	Late Respondents (N = 152)	F DF = (1,1030)
Developing morals and values	2.55	2.75	4.86*
Engineering	0.01	0.01	—
Administration/political science	0.00	0.00	—
Overall GPA	3.02	2.89	4.94*
Cooperative	3.34	3.16	8.56**
Intellectual	2.89	2.76	3.52
Dating scale	1.81	1.93	9.10**
Rebellious	1.90	2.05	4.25*
Deviancy scale	1.82	2.02	17.52***
Beer drinking	1.47	1.56	0.97
Athletic scale	2.90	3.06	4.07*

*$p \leq .05$
**$p \leq .01$
***$p \leq .001$

the early and late respondents during the college years. To address this issue, we used the subset of variables which significantly discriminated early from late respondents after controlling for sex and SES, and which were measured in both the freshman and senior year. This allowed us to compute freshman-senior change scores on six variables: deviance, rebelliousness, athletic activity, dating, and cooperative and intellectual self-concept. Raw change scores were used because prior regression analyses indicated that they were highly correlated with residual scores (actual minus expected change) derived from predicting students' final scores from their initial scores on each of these variables.

There were significant differences in change scores between early and late respondents on three of the six variables. The two groups changed in the opposite direction in all three cases. For example, whereas the early respondents became less deviant over time, the late respondents became moreso. On the other hand, while the early respondents perceived themselves as becoming more cooperative and intellectual over time, the late respondents perceived themselves as becoming less so.

Respondents Versus Nonrespondents

Table 3 shows the freshman-year variables which significantly differentiated the senior-year respondents and nonrespondents. (The number of cases is reduced because 34 senior-year respondents and 50 nonrespondents included in the follow-up had not filled out the freshman version of the CEQ, although they had filled out another freshman year questionnaire.) Nonrespondents had significantly higher scores than respondents on seven variables: deviance, dating, athletic participation, beer and hard liquor consumption, preference for business/economics and administration/political-science type majors. They had significantly lower scores on four variables: freshman GPA, friendships, and preference for engineering and education/social science type majors. Males were more likely than females to be nonrespondents, but mothers' and fathers' education did not significantly differentiate the two groups.

When sex and parental education were controlled, only three of the differences between respondents and nonrespondents still discriminated between the two groups: deviance ($\bar{X} = 1.93$ and 2.11; $F = 4.23, p < .05$) and preference for engineering ($\bar{X} = 0.11$ and 0.01; $F = 4.79, p < .05$) and business/economics ($\bar{X} = 0.09$ and 0.24; $F = 11.24, p < .001$) majors. Once sex was accounted for, dating, athletic activity, beer and hard liquor consumption, GPA, and preference for political science and education/social science majors disappeared as correlates of nonresponse. Parental education was a significant factor only for the friendship scale.

Discussion

We have examined two aspects of nonresponse: differences between early and late senior-year respondents on a follow-up questionnaire, and differences between senior-year respondents and nonrespondents on variables collected during their freshman year. The less responsive groups were significantly different from their more responsive counterparts on nearly a dozen variables representing a wide variety of content areas including academic achievement, self-concepts, alcohol consumption, social deviance, and major-choice preferences. These variables were generally only modestly related (r's $\pm$ .20), except for dating, deviancy, and beer drinking, which showed somewhat higher intercorrelations (r's = about .35 in the senior and .45 in the freshman year).

In general, the kinds of variables that differentiated early from late respondents were similar to those that differentiated respondents from nonrespondents. However, most of the differences between senior-year

TABLE 3. Means and Standard Deviations of Freshman Variables for Senior Year Respondents and Nonrespondents

Variables+	Respondents (N = 931)		Nonrespondents (N = 72)		F DF = (1,1001)
	$\overline{X}$	S.D.	$\overline{X}$	S.D.	
Major Choice					
Engineering	0.10	0.30	0.03	0.17	4.11*
Biology/physical science	0.42	0.49	0.31	0.46	3.33
Education/social science	0.21	0.40	0.11	0.32	3.81*
Business/economics	0.09	0.28	0.26	0.44	24.55***
Administration/political science	0.05	0.21	0.11	0.32	5.77*
Art/music/literature	0.10	0.31	0.11	0.32	0.03
Need for achievement					
Freshman GPA	2.91	0.51	2.71	0.51	10.53***
Educational aspirations	3.94	0.88	3.96	0.82	0.01
Motivation	3.81	0.50	2.88	0.55	1.19
Self-concepts					
Calm	2.77	0.77	2.72	0.86	0.23
Cautious	2.77	0.77	2.76	0.86	0.01
Cooperative	3.21	0.64	3.21	0.67	0.01
Easy going	3.01	0.79	2.97	0.77	0.19
Happy	3.17	0.73	3.14	0.70	0.11

Idealistic	2.89	0.86	2.74	0.92	2.10
Outgoing	2.73	0.89	2.67	0.90	0.29
Poised	2.51	0.76	2.60	0.88	0.84
Intellectual orientation					
Intellectual	2.71	0.74	2.69	0.65	0.07
Sociability					
Dating scale	1.84	0.45	1.95	0.51	3.93*
Friendship scale	3.04	0.59	2.89	0.64	3.82*
Impulse expression					
Rebellious	1.98	0.81	2.11	0.91	1.79
Deviancy scale	1.93	0.58	2.14	0.63	8.58**
Alcohol Consumption					
Beer drinking	2.65	1.12	2.97	1.11	5.53*
Wine drinking	2.65	0.91	2.76	0.96	1.06
Hard liquor drinking	2.35	0.99	2.65	0.97	6.13**
Athletic Participation					
Athletic scale	0.97	0.57	1.15	0.63	6.78**

[+]All variables are measured on a 4-point scale (with 4 high and 1 low) except athletic participation and educational aspirations (3 points), and major choice (dummy variables).
*$p \leq .05$ **$p \leq .01$ ***$p \leq .001$

respondents and nonrespondents were accounted for by sex differences. In fact, after sex and SES were controlled, the two groups differed only on a set of three variables that appear to characterize the more impulsive business-oriented undergraduates. If weights were devised to correct for sample bias according to sex and SES, these students would still be somewhat undersampled.

In the analysis of early versus late respondents, however, only four of eleven variables dropped out as significant differentiating factors when sex and SES were controlled. Therefore, while simple sociodemographic factors accounted for most of the group differences in the freshman variables, they accounted for only a few of the differences in the senior year variables.

These results suggest that researchers cannot account for follow-up nonresponse bias by making statistical adjustments according to data available at initial testing. Since students who vary in their responsiveness to survey research experience different kinds of changes between testings, one cannot accurately predict which variables will be biased at follow-up from data collected at the time of initial testing.

Furthermore, our results estimate which variables would have been biased if we had sampled only 70 of our target group instead of 90%, but there were still 10% who did not respond to the follow-up despite up to five investigator contacts. Called "refusers" by other investigators (Bebbington, 1970) these nonrespondents may or may not be similar to the late respondents on the follow-up variables. Without follow-up data from them it is impossible to know what kind of bias, if any, their omission introduces. In addition, there are a significant number of students who either did not enter the study in the first place, or who could not be located at follow-up because they had left school. Follow-up data obtained from these students might point out other areas of response bias. The kinds of biases highlighted in our analysis thus give only minimal estimates of the "real" bias with respect to our target population.

In a more positive vein, the extent and magnitude of bias found in our data was not very large. There were entire classes of variables (e.g., student ratings of courses and teachers, religious orientation, psychological well-being) in which there was no response bias at all. In areas where response bias did appear, the differences between the two groups were not dramatic. For example, early respondents differed from late respondents on deviancy (the most biased senior variable) by only ¼ of a point on a four-point scale. They differed on overall GPA by only $^1/_{10}$ of a point on a four-point scale. These results suggest that it might be more fruitful to characterize nonrespondents according to patterns or clusters of variables than to rely on any particular variable

by itself. The description of such patterns could help researchers to discern underlying causes of nonresponse and suggest ways of coping with it.

Donald (1960) suggests that a pattern of low motivation characterizes the nonrespondent, a pattern which relates to the degree of personal involvement in the organization in question. Since all college students nearing graduation are at least minimally involved in college, this explanation is probably not relevant to the problems of nonresponse in our survey. However, two studies expand this explanation to cover involvement in the subject matter of the survey (Filion, 1975; Mayer and Pratt, 1966). It is certainly plausible that some seniors are less involved than others in the process of introspection with respect to the college years.

Two variables which were assumed to index involvement in the subject matter of the survey were thus examined: majoring in the social sciences and choosing the understanding of human behavior as an important aspect of college. The data revealed that the late respondents were as likely to be studying social sciences, and professed as much interest in human behavior as the early respondents. In fact, the late respondents' higher interest in the development of morals and values indicate that they may be even more interested than the early respondents in certain kinds of introspection.

A lack of personal responsibility is an alternative explanation for lack of cooperation. This can be indexed in our data by variables such as cooperation, deviance, rebelliousness, and alcohol consumption. In fact, the early respondents differed significantly from the late respondents in the predicted direction on each of these variables. Of the seven variables which differentiated the early from the late respondents independent of sex and SES, four were directly related to lack of personal responsibility. These findings are consistent with those reported by Bebbington (1970), who found that late respondents or "stallers" were characterized by antisocial and amoral attitudes and a tendency toward delinquency.

The present study suggests that survey researchers should consider the notion of personal responsibility when designing follow-up research and formulating follow-up techniques. The choice of data collection techniques should also be made in light of the relatively low response rates of males and low achievers. Research has not clarified the kinds of appeals which would be most successful with these types of respondents, although several studies have indicated that certain kinds of mailing techniques (e.g., deadlines, auto-typed letters, live stamps, special delivery postage) are preferred in following up "stallers" (Astin and Panos, 1969; Linsky, 1975). Once it is clear how to motivate such

potential respondents, researchers should have an easier time eliminating response bias, since, as Kish and Hess (1959) have stated, "only decreasing the proportion of nonresponse will reduce the effect of nonresponse."

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