NON-RESPONSE IN STUDENT SURVEYS:
The Role of Demographics, Engagement and Personality

Stephen R. Porter* and Michael E. Whitcomb*,**

::

What causes a student to participate in a survey? This paper looks at participation across multiple surveys to understand survey non-response; by using multiple surveys we minimize the impact of survey salience. Students at a selective liberal arts college were administered four different surveys throughout the 2002–2003 academic year, and we use the number of surveys participated in to understand how student characteristics such as demographics, engagement and Holland personality type affect cooperation. We find that survey respondents are more likely to be female and socially engaged, less likely to be on financial aid, more likely to be an investigative personality type and less likely to be an enterprising personality type.

::

KEY WORDS: survey non-response; student engagement; Holland personality type; survey methodology; ordered logit.

INTRODUCTION

What causes a student to participate in a survey? If we can better understand the answer to this question, we may be better able to develop techniques to counter survey non-response, which has been increasing in surveys of the general population (De Leeuw and Heer, 2002; Smith, 1995; Steeh, 1981) as well as in student surveys (Dey, 1997). Understanding the student decision to participate in a survey may also help us understand why some institutions are so successful in obtaining student participation in surveys, while others continually face very low response rates. For example, the National Survey of Student Engagement (NSSE) has response rates that vary across 316 different institutions from a low of 14% to a high of 70% (National Survey of Student Engagement, 2003).

*Wesleyan University, Middletown, CT.

**Address correspondence to: Michael E. Whitcomb, Office of Institutional Research, 237 High Street, 304 North College Bldg., Wesleyan University, Middletown, CT 06459, USA. E-mail: mwhitcomb@wesleyan.edu

This variability is even more remarkable given that the survey instrument, sample composition (first-year students and seniors), method of administration, survey administrators (the NSSE center) and survey timing are all constant across these institutions.

Most importantly, understanding non-response sheds much needed light on the quality of our survey data. Are the students who fill out our surveys "professional respondents" (Goyder, 1986) who differ in significant ways from non-respondents? If so, our surveys may systematically over- or under-estimate measures of engagement and satisfaction, as there may be a subset of students from whom we never hear. Given the increasing use of survey data for assessment, performance indicators, and measures of "best colleges," it is vital that we understand exactly who fills out a survey and who does not.

There has been an increasing amount of research on student surveys, but the main focus has been on method of administration. We now know more about how paper versus web surveys (Kwak and Radler, 2002; Pealer et al., 2001; Porter and Umbach, 2004; Sax, Gilmartin, and Bryant, 2003), e-mail surveys (Dommeyer and Moriarty, 2000), number of contacts (Smith and Bers, 1987), incentives (Porter and Whitcomb, 2003b; Zusman and Duby, 1987), survey burden (Adams and Gale, 1982; Couper, Traugott, and Lamias, 2001; Crawford, Couper, and Lamias, 2001; Porter, Whitcomb, and Weitzer, 2004), and variations in the e-mail contact (Porter and Whitcomb, 2003a; Whitcomb and Porter, 2004) all affect student survey response rates. Much less is known about how student characteristics, behaviors and attitudes affect survey response.

In part, this is due to the difficulty of collecting information about characteristics and attitudes of non-respondents. A common approach is a follow-up survey of non-respondents in an initial survey, but as Goyder (1986, p. 28) states,

> The epistemological limitation to surveys on surveys is self-evident; employing an instrument to measure its own performance is immediately contradictory. To assess attitudes toward the survey via attitude surveys is not unlike seeking to comprehend the mechanics of the camera solely from photographs.

The issue here is simple: no matter what efforts are made to elicit cooperation from survey non-respondents in a follow-up survey, large numbers of these non-respondents will also refuse to participate in the follow-up survey. Thus, any analyses will be biased, as these (twice) non-respondents are likely to be quite different from respondents in the initial survey and follow-up survey.

We circumvent this problem in two ways. First, we use student database records and link these data to survey response, thus obtaining background

data for all respondents and non-respondents. Second, similar to Sax et al. (2003), we use a pre-college survey, the Cooperative Institutional Research Program first-year student survey (CIRP) administered by the Higher Education Research Institute (HERI), to obtain several behavioral and attitudinal measures. Because the CIRP has such a high response rate (90–94% in this sample), it is more like a census than a survey, and thus avoids the issue of unrepresentativeness raised by non-response follow-up surveys. In addition, it is administered prior to the beginning of college and offers pre-college measures of behavior and attitudes, as well as valuable measures of previous survey refusal behavior.

Our study is also unique because of our dependent variable. Previous research has looked at response and non-response in a single survey (e.g., Kuh, 2003; Sax et al., 2003), but "periennial" non-respondents are a subset of non-respondents in any given survey, as response is also greatly affected by salience (Goyder, 1982; Groves, Singer, and Corning, 2000; Heberlein and Baumgartner, 1978). Normally cooperative students may decline to participate in a single survey simply because the survey content bores them. In our research project, as part of a larger experiment a group of students were administered four different surveys throughout an academic year, and we use the number of surveys participated in to understand how student characteristics affect cooperation. By using multiple surveys rather than one, we are able to minimize the impact of salience on survey response.

Finally, we focus not only on demographics but also student attitudinal data. Historically, researchers and practitioners have emphasized the relationship between demographic characteristics and survey response. One driving force behind this emphasis was a desire to understand to what extent survey results capture the viewpoints of all campus constituencies. That is, demographic characteristics have been emphasized to ensure the representativeness of survey data across racial/ethnic and gender groups. By adding behavioral and attitudinal measures to the mix, this study can better estimate how survey results are affected by the error introduced by non-response.

LITERATURE REVIEW

Methods for Studying Non-response

In general, there have been four main approaches to analyzing non-response. Figure 1 presents stylized examples of these approaches. In each example, the base survey is conducted with a response rate of 40%; thus 40% of each bar in the "base survey" column is shaded to indicate the

Research approach   **Base survey**   **Additional data**

Time of response analysis
Respondents to the base survey are analyzed based on when
they completed the survey, early in the survey process
versus late in the survey process. These two groups are
compared, with no additional data collection.

Nonresponse followup survey
Nonrespondents (or a subset of nonrespondents) to the base
survey are administered a second survey, usually with
intense efforts to ensure response. Respondents to the
followup survey are compared with original respondents to
the base survey, using data from both surveys.

Panel survey
Respondents to the base survey are administered one or
more followup surveys. Nonrespondents in these
successive surveys are compared to respondents, with
nonresponse analyzed using data from the base survey.

Record linkage
Both respondents and nonrespondents to the base survey are
linked to database records that are available for the full
sample, such as demographic or financial information.
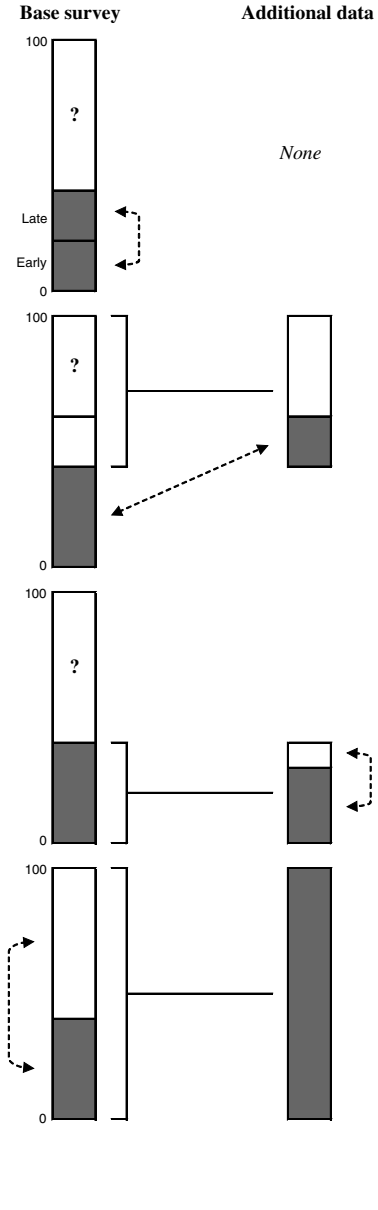These data are used to analyze nonresponse.

Information is available for this group

? Almost nothing is known about this group

◄--► Groups compared to understand nonresponse

FIG. 1. Approaches to understanding survey non-response.

respondents. The bracket indicates the attempt to obtain additional data for members of the base sample.

The first example estimates non-response bias by comparing individuals who respond early in the survey administration process to late responders. Guided by the continuum of resistance model (e.g., Lin and Schaeffer, 1995), this method assumes that late responders are very similar to non-responders. That is, had data collection ended at an earlier date, current late responders would be non-respondents. In the figure, 40% of the sample responds to the base survey, with one half of these individuals being classified as early responders.

To understand the characteristics of survey non-respondents and the possible biases in survey data, time of response analyses tests for differences between early and late responders using the original survey as the source of information (e.g., Lahaut et al., 2003; Voigt, Koepsell, and Daling, 2003). This method can be used to compare the demographic, behavioral and attitudinal qualities of early and late responders, as long as this information was collected in the initial survey. One advantage of this method is the ability to estimate non-response bias with the survey instrument employed to collect data; additional data collection is not required. On the downside, however, the definition of a ''late responders'' is arbitrary and the cut point used by researchers may influence results.

In the second example, non-response in a base survey is analyzed by conducting a follow-up survey of non-respondents, usually with intense effort to ensure a high response rate (e.g., Brennan and Hoek, 1992; Kuh, 2003).[1] The advantage of this approach is the ability to collect attitudinal and behavioral data for non-respondents. But because the follow-up survey is focused on a non-cooperative group, these surveys never obtain information for all non-respondents in the base survey. In the figure, 40% of the sample responds to the base survey, with a follow-up survey administered to the 60% who did not fill out the base survey. But only 20% of the original sample participates in the follow-up survey, meaning that we still know little or nothing about the 40% of the base sample who did not participate in either survey.

A non-respondent follow-up survey to the NSSE shows how difficult it can be to obtain the cooperation of non-respondents. The NSSE non-respondent survey obtained responses for less than a quarter of non-respondents.[2] Yet this low response rate was achieved even after shortening the original NSSE survey, using experienced telephone interviewers, and calling non-respondents at least a dozen times (Kuh, 2003). Even with the most intense survey effort, a follow-up survey of non-respondents is likely to result in a biased pool of respondents.

In the next example, a panel survey is used to understand non-response (e.g., Sax et al., 2003; Singer, Groves, and Corning, 1999). Here respondents rather than non-respondents are administered a second survey (and often additional waves of surveys). Non-response in later waves is analyzed, using data collected in the base survey. Similar to the previous example, one advantage of this approach is the ability to collect detailed data on members of the sample using the base survey. And while illuminating, these studies only aid understanding of non-response in the context of longitudinal surveys. In the figure, 60% of the sample who did not participate in the base survey is not examined. It should also be noted that the usefulness of this approach is also positively related to the response rate in the base survey.

The fourth example shows the advantages of the record linkage approach, where records on all members of the base sample are linked to their survey response, and data from these records are used to understand non-response (e.g., Goyder, 1986, 1987; Goyder, Warriner, and Miller, 2002; Moore and Tarnai, 2002). Goyder (1986), for example, combined survey data with municipal taxation records and city directories to obtain information on socioeconomic status (SES), age, and religion. By using non-survey data, this approach avoids the selection problem of non-response follow-up surveys and panel surveys. The disadvantage, however, is the lack of attitudinal and behavioral data.

Correlates of Non-response

What do studies using these approaches tell us about survey non-response? We review the literature in three different areas to answer this question. The first area is studies of non-response in the general population. While this research does not analyze college students *per se*, the results are still informative about possible correlates of non-response among college students. The second area is studies of non-response among college students. These studies are more informative in terms of our research topic, but unfortunately the amount of research in this area is limited. The third set of literature that we review is research on students who volunteer to participate in psychology experiments. These studies are useful given the study population, and because the decision to participate in these experiments is often similar to the decision to participate in a survey.

The General Population

In surveys of the general population, the most common finding is the impact of SES on response: more affluent or educated individuals are more

likely to participate in surveys (Curtin, Presser, and Singer, 2000; Goyder, 1986; Goyder et al., 2002; Groves et al., 2000; Kandel and Raveis, 1983; Singer et al., 1999; Singer, van Hoewyk, and Maher, 2000), and are less likely to drop out of panel studies (Kandel and Raveis, 1983; Laurie, Smith, and Scott, 1999) than less affluent or educated individuals. Gender has also been found to play a significant role in survey response, with women responding in greater proportions than men (Curtin et al., 2000; Groves and Couper, 1996; Moore and Tarnai, 2002; Singer et al., 2000). Race is another demographic characteristic that has been linked to survey response (Curtin et al., 2000; Groves et al., 2000; Singer et al., 1999, 2000; Voigt et al., 2003) and panel survey attrition (Kandel and Raveis, 1983), with whites responding more often than non-whites.

Along with SES, race and gender, age is also correlated with survey response. Older individuals are less likely to participate in personal interviews (Lowe and McCormick, 1955) and surveys (Goyder, 1986; Kandel and Raveis, 1983; Moore and Tarnai, 2002). Using a sample of the elderly, Kaldenberg and his colleagues (Kaldenberg, Koenig, and Becker, 1994) found that non-response increased over one half of a percentage point for each year increase of respondents' age.

Other research has compared how the relevance of the survey topic differs for respondents and non-respondents. Groves, Singer, and Corning (2000) found that individuals with high levels of community involvement were more likely to respond to a survey regarding an issue being publicly debated at the time of the survey administration than individuals with low levels of community involvement. Similarly, to understand the relationship between survey topic involvement and survey participation, Kojetin, Borgida, and Snyder (1993) combined municipal recycling records with their survey data measuring recycling attitudes, behavior, and awareness and found that survey respondents recycled significantly more frequently than non-respondents and that promptness of survey response was related to recycling attitudes, behaviors, and awareness. Individuals responding to the survey following the third contact (late responders) recycled less often and were less aware of and knowledgeable about of recycling than individuals responding after one of the first two contacts (Kojetin et al., 1993).

Further evidence of the relationship between topic involvement and survey participation comes from Van Kenhove, Wijnen, and De Wulf (2002), who compared two survey topics that differed on the average level of involvement in the sample. They found that differences in topic involvement between respondents and non-respondents only existed for the high involvement topic, suggesting that individuals' involvement must

surpass a critical level in order to influence the decision to participate in a survey.

In addition to topic involvement, prior survey refusals and the number of previously completed surveys are two other behavioral characteristics that serve as important predictors of non-response (Brennan and Hoek, 1992; Goyder, 1986; Groves and Couper, 1996; Stinchcombe, Jones, and Sheatsley, 1981). As Bradburn (1978, p. 37) states,

> On the whole, however, the fact that respondents have previously responded to an interview is the best predictor of subsequent participation, given that they can be located. After several waves of interviewing, one has probably gotten a sample of co-operative respondents who will continue to participate.

College Student Populations

Research specific to student populations finds many of the same demographic correlates of survey response. For example, females usually respond at higher rates than males (Crawford et al., 2001; Dey, 1997; Hutchinson, Tollefson, and Wigington, 1987; National Center for Education Statistics, 2002; National Survey of Student Engagement, 2003; Sax et al., 2003) and White students are more likely to respond than non-whites (Dey, 1997; National Center for Education Statistics, 2002). Academic factors are also related to survey participation. Dey (1997) found high school GPA and students' self-ratings of academic ability to be the two student characteristics most correlated with survey response. Similarly, in a study equating late responders to non-respondents, late responders had lower GPAs than both early responders and the overall student population (Hutchinson et al., 1987). Economic predictors of student response also mirror findings from the general public, with students on financial aid being more likely to respond than those not on aid (National Center for Education Statistics, 2002). However, because this study focused on financial aid, survey salience may also have contributed to the increased response by students on aid.

The behavioral and psychological correlates of student non-response have also been explored. Johnson and Mowrer (2000) tested for personality differences between mail survey respondents and non-respondents. In their college student sample respondents did not differ from non-respondents on any of the "Big Five" personality dimensions.[3] While personality differences have not emerged, there is some evidence that students' level of engagement influences survey participation. Using telephone interviews to follow-up with NSSE non-responders, Kuh (2003) found that students who did not respond to the NSSE were slightly more

engaged than their participating peers. Kuh cautions, however, that this finding may be attributed to the positive mode effects associated with the use of telephone interviews for follow up with NSSE non-respondents.

Timing of Subject Pool Participation

Finally, there is a body of research that does not look at student survey response, but, nonetheless, is very useful in understanding why some students take part in a survey. A substantial body of literature in psychology examines how students who volunteer for the research subject pool early in the semester differ from students who participate in the pool late in the semester. Demographic results from this research mirror the findings of the survey non-response literature. Females participate earlier in the semester than males (Cooper, Baumgardner, and Strathman, 1991; Evans and Donnerstein, 1974; Roman et al., 1995; Stevens and Ash, 2001; Zelenski, Rusting, and Larsen, 2000) and students who participate earlier in the semester have higher GPAs (Aviv et al., 2002; Cooper et al., 1991; Evans and Donnerstein, 1974) and work fewer hours per week (Stevens and Ash, 2001) than students volunteering later in the semester.

Psychologists have also tested whether motivational and personality characteristics are correlated with the timing of subject pool participation. While the results of these studies have been mixed (Aviv et al., 2002),[4] studies focusing on the relationship between the ''Big Five'' personality dimensions and subject pool participation have yielded some consistent findings. First, an inverse relationship between extraversion and early participation has been replicated across studies (Aviv et al., 2002; Liberty, 1993). Additionally, Aviv and her colleagues (Aviv et al., 2002) and Stevens and Ash (2001) found a moderate negative correlation between week of participation and conscientiousness and a moderate positive relationship between week of participation and openness. In sum, this research suggests that late-semester participants are more extraverted, more open, and less conscientious than students volunteering early in the semester.

Summary

There are four main approaches to studying survey non-response. Non-response follow-up surveys and panel surveys can collect a rich variety of data, but are limited in that many non-respondents are not included in the analysis. Studies examining the timing of survey participation can provide insight into how respondents and non-respondents differ, but the validity of this methodology may be called into question as

non-respondents are not actually studied and because the point at which individuals are classified as "late responders" is arbitrary. The record linkage approach avoids these biases, but is limited by the data available for analysis.

Findings from these four approaches converge regarding the characteristics associated with survey participation: survey response is greatest for females, Whites, more affluent individuals, and those having higher levels of academic preparation, academic achievement, and engagement. Some studies have also linked attributes of personality to survey participation. If personality characteristics do indeed translate into survey response/non-response then there will be an additional source of error in our data, particularly for measures highly correlated with a dimension of personality (e.g., social engagement measures and extraversion). Furthermore, standard demographic-based weighting schemes may not account for these differences and our results will be biased.

Finally, the literature indicates that survey salience has a significant impact on survey participation. This research implies that any non-response study that relies on only one survey to study non-response may have biased results, as the impact of survey topic may vary across demographic and attitudinal groups.

METHODOLOGY

Our study combines the record linkage and panel survey approaches to study survey non-response at a selective liberal arts college. By combining these two approaches, we can rely on the strengths of each while minimizing their weaknesses. In our first set of analyses, we use the record linkage approach to obtain demographic and academic background information for all students from admission and course registration databases. Because all 462 students in the survey experiment are included, we have included typically non-cooperative students in this part of the analysis.

In our second set of analyses, we adopt the panel survey approach by using data from the 1998–2002 CIRP freshman surveys administered each year during orientation at the beginning of the fall semester (see Sax et al., 2001 for more information). Unlike many panel studies, the advantage of the CIRP at this particular institution is the high response rate, which for the three classes in this study range from 90–94%. Through an iterative merging process using SSN and demographic data, we can match 91% (N = 420) of the full sample to their CIRP responses. While the missing 9% of students (N = 42) may be atypical in that they are students who

usually do not respond to surveys, this percentage is fairly low compared to many panel survey non-response studies.

The result is two datasets available for analysis. The first contains all 462 students in the survey experiment, and the second contains the subset of 420 students who could be matched to their CIRP survey responses. These students are all first-time, full-time degree-seeking students who were classified as sophomores, juniors, or seniors during the 2002–03 academic year.[5] We focus on these 462 students because they were randomly selected from the student body to participate in a larger experiment measuring survey fatigue and were administered four different surveys as part of this larger experiment.

Dependent Variable

Given our interest in understanding why students participate in surveys, how we construct the dependent variable is very important. Previous studies of the general population (Groves et al., 2000; Kaldenberg et al., 1994; Kojetin et al., 1993) and college students (e.g., Kuh, 2003; Sax et al., 2003) have focused on non-response in a single survey. The problem with this approach is that salience plays a large role in survey response, with response more likely when the survey topic is of interest to the respondent (Goyder, 1982; Groves et al., 2000; Heberlein and Baumgartner, 1978; Tuckel and O'Neill, 2002). Survey salience can confound estimates of the impacts of independent variables; research indicates that the impact of demographic characteristics varies across survey topics (McDaniel, Madden, and Verille, 1987).

To moderate the impact of salience we use a series of surveys conducted throughout the 2002–03 academic year to measure survey cooperation. The surveys covered four different subjects:dining services, alcohol and drug use, student engagement behavior, and student satisfaction. All four surveys were administered via the Web to all 462 students. Each survey had a response rate for our experimental group between 38 and 44%.[6] Rather than focus on a single survey, our dependent variable is the number of surveys in which a student participated, and ranges from 0 (no surveys) to 4 (all surveys). The distribution of this variable is presented in Table 1 for the full sample.

As can be seen in the first column, only 14% of students participated in all four surveys, even though the response rate for each individual survey was at least 38%. Fifty-seven percent participated in some but not all surveys, while 29% of the students were hard-core non-responders and did not participate in any survey. To put this last number in perspective, Tuckel and O'Neill (2002) found that nearly 40% of individuals in their

TABLE 1. Survey Participation

	Distribution in sample				Surveys			
	%	N	%	N	Alcohol & drug	Dining	Engagement	Satis-faction
Survey response rate					41%	45%	38%	39%
Response profiles						Responded to survey?		
All four surveys	14.1	65	14.1	65	Yes	Yes	Yes	Yes
Three surveys	16.0	74	2.2	10	Yes	No	Yes	Yes
			2.6	12	Yes	Yes	No	Yes
			5.8	27	Yes	Yes	Yes	No
			5.4	25	No	Yes	Yes	Yes
Two surveys	17.7	82	3.9	18	Yes	Yes	No	No
			2.6	12	Yes	No	Yes	No
			3.7	17	Yes	No	No	Yes
			3.0	14	No	Yes	Yes	No
			3.2	15	No	Yes	No	Yes
			1.3	6	No	No	Yes	Yes
One surveys	23.2	107	6.3	29	Yes	No	No	No
			6.5	30	No	Yes	No	No
			3.7	17	No	No	Yes	No
			6.7	31	No	No	No	Yes
No surveys	29.0	134	29.0	134	No	No	No	No
Total	100.0	462	100.0	462				

study stated that they typically refused to participate in surveys, and Goyder (1986) found that almost half of the members of his sample refused their last contact requesting participation in an interview or mail survey. Thus, it appears that in most populations a significant proportion of people never participate in a survey.

To shed more light on how and when students respond, Table 1 shows the response profiles of the students. A "yes" in a column indicates participation in that particular survey, and the table also shows the number and percentage of students in each response profile. As can be seen, students often chose to participate in some but not all surveys. Much of this variation is undoubtedly due to differences in survey salience. For example, Couper (1997) found that individuals who either describe themselves as not interested in or as not knowledgeable about politics were less likely to take part in the 1990 National Election Study. The influence of survey content on participation (as well as other factors such as timing

and survey length) shows the value of using several different surveys to measure survey cooperation.

Independent Variables

We use five sets of independent variables to predict survey participation (see Table 3). The first consists of the standard demographic variables typical of many analyses of student outcomes:gender, racial/ethnic group, whether the student was on financial aid, and first generation college student. Given previous research we expect females to cooperate more often than males, whites more often than non-whites, and students from higher socio-economic backgrounds to cooperate more often.

The second set measures the academic background of the student, their class year (sophomore or junior versus senior) and academic performance (end of year grade point average for the year the surveys were administered). Fewer senior students are expected to participate due to institutional survey fatigue, as they will have been contacted more times to participate in institutional surveys than sophomores or juniors. In line with previous research, we also expect students with high GPAs to be more likely to participate than their lower performing peers. However, the mechanism which leads students with superior academic credentials to participate in surveys is unknown.

The third set of variables is a set of scales measuring pre-college engagement (see Table 2). Engagement in college an important measure, as it is a major predictor of learning and personal development (e.g., Kuh, 2003). In addition, student engagement has been linked to survey response, with less engaged students possibly more likely to respond to surveys (Kuh, 2003). We use two scales derived from the CIRP survey to measure student engagement:one measuring social engagement, the other measuring engagement in studying behavior. These variables are factor scores with a mean of 0 and a standard deviation of 1.

The fourth set of variables contains Holland (1966, 1985) personality measures, also derived from the CIRP survey (see Table 2). These have been used to understand student behavior in other contexts (e.g., Smart, Feldman, and Ethington, 2000; Umbach and Porter, 2002). Personality type may affect survey response, as different types of students react to the various social norms and obligations that a request for survey participation evokes. Such norms and obligations play a key role in survey response (Groves, Cialdini, and Couper, 1992). As seen in Table 2, the four personality scales derived from the CIRP are investigative, social, artistic and enterprising (Smart et al., 2000). Since investigative personality types "value the development or acquisition of knowledge" (Smart et al., 2000,

TABLE 2. Scales

Scale	Alpha	CIRP item
Engagement: social	0.72	Frequency in high school: performed volunteer work
		Frequency in high school: discussed religion
		Frequency in high school: discussed politics
		Frequency in high school: attended a public recital or concert
		Frequency in high school: visited an art gallery or museum
		Frequency in high school: participated in organized demonstrations
		Frequency in high school: voted in a student election
		Hours in high school: student clubs/groups
		Hours in high school: volunteer work
		Plans for college: participate in volunteer or community service work
		Plans for college: participate in student pro tests or demonstrations
		Plans for college: participate in student government
Engagement: studying	0.61	Frequency in high school:studied with other students
		Frequency in high school: was a guest in a teacher's home
		Frequency in high school: asked a teacher for advice after class
		High in high school: studying/homework
		High in high school: talking with teachers outside of class
Personality: investigative	0.57	Goal: making a theoretical contribution to science
		Rating: academic
		Rating: drive to achieve
		Rating: mathematical ability
		Rating: self-confidence (intellectual)
Personality: social	0.80	Goal: becoming involved in programs to clean up the environment
		Goal: helping others who are in difficulty
		Goal: helping to promote racial understanding
		Goal: influencing social values
		Goal: influencing the political structure

TABLE 2. *(Continued)*

Scale	Alpha	CIRP item
		Goal: participating in a community action program
Personality: artistic	0.73	Goal: becoming accomplished in one of the performing arts
		Goal: creating artistic work
		Goal: developing a meaningful philosophy of life
		Goal: writing original works
		Rating: artistic ability
		Rating: writing ability
Personality: enterprising	0.74	Goal: becoming an authority in my field
		Goal: becoming successful in a business of my own
		Goal: being very well off financially
		Goal: having administrative responsibility for the work of others
		Goal: obtaining recognition from my colleagues for contributions to my field
		Rating: leadership ability
		Rating: popularity
		Rating: self-confidence (social)

p. 37), we expect investigative individuals to be survey cooperators, as they are likely to perceive our surveys as exercises aimed at acquiring information. These variables are factor scores with a mean of 0 and a standard deviation of 1.

The final set of variables measure students' survey behavior in the past. For the full sample, we use whether or not we were able to match a CIRP response as a measure of past survey participation behavior. Past survey participation has been shown to be a strong predictor of future survey participation (Goyder, 1986; Groves and Couper, 1996). While there is some measurement error in this variable due to the matching process, and also because some students may not have been present during orientation to take the survey, the magnitude of this variable will also allow us to understand whether the students not included in the second set of analyses differed in later survey participation than the included students.

For the reduced sample, we include a variable indicating whether the student granted HERI permission to release their social security number

back to the college in this study.[7] This is an important variable because it acts as a proxy for privacy concerns and how the respondent's data will be used. Previous research has indicated that attitudes about privacy in general as well as how it relates to survey research is correlated with survey response.

Statistical Technique

We use an ordered logistic regression model to analyze survey response, as students had up to four opportunities to participate in a survey. This approach is useful when the dependent variable can be rank ordered, but the variable cannot be considered continuous (Long, 1997). For example, the difference between participating in 0 and 1 surveys may not be same as the difference between participating in 3 and 4 surveys.

Ordered logit assumes an underlying continuous latent variable, with an observed variable representing discrete sections of the latent variable. For example, following Greene (1997), we assume that there exists a continuous, latent measure of cooperation y^*. We cannot directly measure this variable; however, we do observe the number of surveys y in which a student participates. Thus we assume that

$$y = 0 \text{ (student participated in 0 surveys) if } y^* \leq 0.$$
$$= 1 \text{ (student participated in 1 survey) if } 0 < y^* \leq \mu_1,$$
$$= 2 \text{ (student participated in 2 surveys) if } \mu_1 < y^* \leq \mu_2,$$
$$= 3 \text{ (student participated in 3 surveys) if } \mu_2 < y^* \leq \mu_3,$$
$$= 4 \text{ (student participated in all 4 surveys) if } \mu_4 \leq y^*.$$

The parameters μ_1–μ_4 are known as cutpoints or thresholds, and are estimated along with the coefficients for the independent variables. Note that the distance between cutpoints can vary with this formulation.

RESULTS

The ordinal logit results are presented in Table 3. Two sets of models were run: the first set on the full data created using the record linkage approach, and the second set on the reduced sample that combines the record linkage and panel study approaches.

The full sample models use demographic and academic background data from institutional databases to predict survey response. As seen in the first column of the table, survey response is predicted by two demographic and one academic background measure. In line with previous research,

TABLE 3. Model Results

	Full sample		CIRP respondents only	
	1	2	3	4
Demographics				
Female	0.707**	0.710**	0.819**	0.794**
African	−0.442	−0.418	−0.597[+]	−0.545
Asian	0.010	0.018	−0.118	0.069
Hispanic	−0.520	−0.530	−0.516	−0.408
Other/unknown	0.270	0.295	0.262	0.431
Non-resident alien	−0.242	−0.256	−0.377	−0.083
First generation	0.172	0.181	0.195	0.229
Financial aid status	−0.408*	−0.420*	−0.413*	−0.432
Academic background				
Clas–sophomore	0.203	0.205	0.253	0.311
Class–junior	−0.353	−0.365[+]	−0.337	−0.212
Cumulative GPA	0.078**	0.078**	0.070**	0.041
Engagement scales				
Social				0.350*
Studying				0.068
Personality scales				
Investigative				0.300**
Artistic				−0.198*
Social				−0.151
Enterprising				0.319**
Past survey behavior				
CIRP non-match		−0.215		
CIRP ID refusal				−0.017
Cutpoints				
μ_1	−8.896**	−8.871**	−8.243**	−5.888*
μ_2	−7.847**	−7.820**	−7.172**	−4.782*
μ_3	−7.006**	−6.978**	−6.355**	−3.924
μ_4	−5.930**	−5.902**	−5.274	−2.789
N	462	462	420	420
Pseudo R-square	0.14	0.14	0.14	0.20
−2 log likelihood	1390.3	1389.7	1260.3	1233.4

Note: **$p < 0.01$, *$p < 0.05$, [+]$p < 0.10$.

females and students with high GPAs are more likely to take part in surveys, while students receiving financial aid are less likely to do so.

Also using the full sample, we then added a variable that specified whether an individual's data from the CIRP survey were available

(see column 2). This dummy variable is coded as a ''1'' in the cases where CIRP data were available and successfully merged with institutional data and as a ''0'' in the cases where CIRP data either did not exist or were not successfully merged with other measures. This variable treats individuals who did not participate in the CIRP survey and individuals for whom we could not successfully link CIRP data to other data identically.

As seen in column 2, the availability of CIRP data is not a significant predictor of subsequent survey participation and therefore the omission of students without CIRP data from the subsequent models will not impact our overall results. Results from the second model using the full sample mirror results from the first model; the demographic and academic background measures found to be significant predictors of survey participation remain the same. Statistically significant effects were found for females, students on financial aid and GPA, and the parameter estimates for these criteria are virtually identical to the estimates derived in the first model.

Columns 3 and 4 of Table 3 present the results of analyses combining the record linkage and panel survey approaches. That is, these models include students linked to institutional database records for whom CIRP survey data were available. The model presented in column 3 replicates the analysis in column 1 in this new sample by testing the prediction of survey response solely from demographic and academic background variables. Results closely mirror the findings from the full sample model; again we see that females and students with high GPAs are more likely to participate in surveys, while students on financial aid are less likely to do so.

In addition to demographic characteristics and academic background variables, the final model adds measures of engagement, personality type, and a dummy variable coding whether or not students granted permission to match their CIRP survey data to predict survey response (see column 4).

The effects of the demographic predictors remained unchanged:being female is positively related to survey response and receiving financial aid is negatively related to survey response. Student GPA is no longer a significant predictor of survey participation as in the previous models. This is likely due to the relationship between GPA and the personality scales; the measures of personality include questions about academic ability, and the personality scales now account for the variation previously attributed to GPA.

The addition of CIRP panel survey data adds several significant predictors of survey response to the model. First, there is a positive relationship between social engagement and survey participation, with socially engaged students being more likely to take part in surveys than their less engaged peers. This finding is in contrast to findings from the

NSSE (Kuh, 2003). The difference in these findings is most likely due to the research design. Unlike the NSSE non-respondent research, we have very little missing data in our research design.

Personality measures derived from the CIRP survey were also found to be significant predictors of survey response. Individuals with high scores on the investigative personality type were more likely to respond to surveys than individuals scoring low on this trait. Conversely, higher scores for the artistic and enterprising personality measures predicted a decreased probability of survey participation. Note that the addition of the engagement and personality scales to the base model increases the pseudo R-squared by 43%.

LIMITATIONS

The chief limitation of the current study is that we examine survey non-response at only one institution, a selective liberal arts college. Future research should examine non-response patterns across multiple institutions of various types.

It is also unclear how generalizable our findings are to adult populations other than college students. The ability to replicate this research, however, is limited by the absence of data for the general population that can match the data available for our students. For example, information about individuals' academic background, level of engagement, and personality are simply not available for the general public.

While the record linkage approach provides many demographic and academic characteristics for studying survey response, the availability of panel survey data is limited. Scales were derived from the CIRP because this is the only pre-college survey with a high response rate that was available. Additional survey data would be useful to study survey non-response. Future studies, for example, could incorporate questions about student attitudes towards surveys, such as Goyder (1987). Only when we more fully understand the attitudes that dissuade students from participating in surveys, can we make targeted efforts to combat these drivers of survey non-response.

DISCUSSION

By combining the record linkage and panel survey data approaches we were able to study survey non-response in a unique and informative way. This approach allowed us to go beyond the ubiquitous demographic and academic background predictors of survey participation, and examine student engagement, personality, and past survey behavior as they relate

to survey response. Furthermore, by examining participation across multiple surveys, we minimized the influence survey salience played on our dependent measure, survey response.

It is surprising that hard-core cooperators are such a small segment of population. Like Goyder (1986), we had speculated that a substantial proportion of students consistently participated in our surveys. This finding is somewhat reassuring in that it refutes the idea that there is one single group of students controlling the results of our surveying efforts. However, it is alarming that almost one-third of the students in our sample did not take part in any of the four surveys; our survey results do not include a substantial proportion of the student body.

Our findings are in line with previous research regarding the role of gender, economic status (financial aid), and academic performance (GPA) in survey response. In addition to these standard demographic predictors, this study provides evidence that personality and student engagement impact survey participation, with more engaged students and students with investigate personalities more likely to respond, and students with enterprising personalities less likely to respond.

To place these results in perspective, Table 4 compares the demographic, engagement, and personality characteristics of typical survey respondents to typical non-respondents. We define typical respondents, or cooperators, as those students who responded to at least three of the four surveys and typical non-respondents, or refusers, as those students who either did not respond to any surveys or responded to only one survey. This comparison provides us with a sense of what characteristics we might expect to see in the respondent and non-respondent pools for a typical survey, regardless of topic.

TABLE 4. Difference Between Refusers and Cooperators

Variables	Refusers (responded to 0 or 1 surveys)	Cooperators (responded to 3 or 4 surveys)	Difference
Demographics			
Female (%)	41.6	65.9	24.4
On financial aid (%)	58.0	38.8	−19.2
Engagement scale			
Social	−0.14	0.19	0.33
Personality scales			
Investigative	−0.21	0.08	0.29
Artistic	−0.22	−0.14	0.08
Social	−0.02	0.06	0.08
Enterprising	0.16	−0.31	−0.47

As can be seen, 66% of cooperators are female while only 42% of refusers are female. Over half of all refusers are on financial aid, while only 39% of cooperators received aid. These results indicate that many student surveys may be biased in favor of females and students with higher SES. However, these results are less troubling, as most institutions can use institutional databases to weight responses based on gender and financial aid status.

More troubling are the differences between cooperators and refusers for the engagement and personality scales. Social engagement, measured as a factor score, differs between refusers and cooperators by one-third of a standard deviation, with cooperators being more socially engaged than refusers. This finding suggests that surveys such as the NSSE may be overestimating engagement for schools, as more engaged students are more likely to participate in a survey.

Substantive differences between cooperators and refusers also exist for two of the four personality types. Cooperators are more investigative and less enterprising than refusers, with the magnitude of these differences equaling one-third and one half of a standard deviation, respectively. This finding suggests that surveys geared towards specific topics, such as the natural sciences, may over (or under) estimate means and relationships between variables due to the self-selection of certain personality types.

Using Holland's personality typology as operationalized by Smart et al. (2000), we found evidence that student personality is related to survey response. Much of the previous research on personality and survey participation has focused on the relationship between the "Big Five" dimensions of personality, not Holland's typology. However, two meta-analytic studies (Barrick, Mount, and Gupta, 2003; Larson, Rottingham, and Borgen, 2002) have examined the intercorrelations of the "Big Five" and Holland's Big Six personality measures (For a review, see Mount et al., 2004). Of the 30 correlations, both studies found only four correlations greater than 0.25, and in both studies, these were for the same four pairs of measures. Of these four, the strongest correlations were between the enterprising type and extraversion (Barrick et al., $r = 0.41$; Larson et al., $r = 0.41$) and the artistic type and openness (Barrick et al., $r = 0.39$; Larson et al., $r = 0.48$).

Given the similarity between enterprising types and extraversion, our finding that enterprising types are likely to be survey refusers falls in line with research showing that extraverts tend to be latecomers to the subject pool (Aviv et al., 2002; Liberty, 1993). Similarly, given the strong correlation between the artistic type and openness, our finding that students with artistic personalities are less inclined to participate in our surveys replicates previous research showing that late-semester subject

pool participants tend to have higher scores on the openness dimension than their early participating peers (Aviv et al., 2002; Stevens and Ash, 2001).

Personality is emerging as an important factor in the decision to take part in surveys. By understanding the role of personality in survey participation more fully, we will be able to develop and employ techniques to counter survey non-response. Furthermore, since personality has also been shown to be a strong predictor of student major choice (Porter and Umbach, 2002), we must be aware that survey measures related to majors, for example satisfaction with a field of study or participation in laboratory courses, will be biased. Additionally, analysis comparing survey items across major fields of study will be prone to error.

The current study also provides us with insight as to why response rates vary between institutions. Student composition across schools varies on many of the measures found to predict survey participation. For example, socioeconomic background and percentage of students receiving financial aid fluctuates from one school to another. The level of students' academic preparation also varies across institutions. Finally, institutions themselves have ''personalities'' and social climates that attract certain types of individuals. Together, all of these factors promote the disparate response rates we see across institutions.

There are two main implications of these findings for research in higher education. First, we must discover effective ways to combat non-response among typically resistant demographic groups such as males. Second, we must consider ways to adjust our data for non-response in ways other than the standard demographic weighting schemes. Otherwise, measures such as student social engagement will continue to be biased by the impact that student engagement and personality have on survey participation.

ENDNOTES

1. Note that follow-up surveys can take a more complicated form. Brennan and Hoek (1992), for example, surveyed both respondents and non-respondents to their base survey, so their analysis was a cross between a simple non-response survey and a panel survey. Similarly, some panel surveys try to contact initial non-respondents in later survey waves.
2. Kuh (2003), p. 12, states that the NSSE follow-up survey contacted between 100 and 200 non-respondents at 21 schools, with 553 completed interviews. Thus the response rate lies between 13% (553/(200*21)) and 26% (553/(100*21)).
3. The ''Big Five'' personality dimension are Extraversion, Agreeableness, Conscientiousness, Neuroticsm, and Openness (McCrae and Costa, 1996).
4. This body of research has been inconsistent in both the constructs measured as well as the instruments employed.

5. First-year students are excluded from our analysis because the CIRP administration method for this class changed from previous classes. The CIRP response rate for first-year students was 68%, too low to include them in the analysis.

6. Response rates in our experiment are Response Rate 6, as calculated by the American Association of Public Opinion Research (American Association for Public Opinion Research, 2004). This response rate assumes that there are no cases of unknown eligibility and it counts both partial and completed surveys as responses.

7. "Do you give the Higher Education Research Institute (HERI) permission to include your ID number should your college request the data for additional research analyses? HERI maintains strict standards of confidentiality and would require your college to sign a pledge of confidentiality." (Sax et al., 2001).

REFERENCES

Adams, L. L. M., and Gale, D. (1982). Solving the quandry between questionnaire length and response rate in educational research. *Research in Higher Education* 17(3): 231–240.

American Association for Public Opinion Research (2004). *Standard definitions: Final dispositions of case codes and outcome rates for surveys*, Lenexa, KS.

Aviv, A. L., Zelenski, J. M., Rallo, L., and Larsen, R. J. (2002). Who comes when: Personality differences in early and later participation in a university subject pool. *Personality and Individual Differences* 33: 487–496.

Barrick, M. R., Mount, M. K., and Gupta, R. (2003). Meta-analysis of the relationship between the Five-Factor Model of personality and Holland's Occupational types. *Personal Psychology* 56: 46–74.

Bradburn, N. M. (1978). *Respondent burden*. Paper presented at the The American Statistical Association, Proceedings of the Survey Research Methods Section.

Brennan, M., and Hoek, J. (1992). The behavior of respondents, nonrespondents, and refusers across mail surveys. *Public Opinion Quarterly* 56(4): 530–535.

Cooper, H., Baumgardner, A. H., and Strathman, A. (1991). Do students with different characteristics take part in psychology experiments at different times of the semester? *Journal of Personality* 59: 109–127.

Couper, M. P. (1997). Survey introductions and data quality. *Public Opinion Quarterly* 61(2): 317–338.

Couper, M. P., Traugott, M. W., and Lamias, M. J. (2001). Web survey design and administration. *Public Opinion Quarterly* 65: 250–253.

Crawford, S. D., Couper, M. P., and Lamias, M. J. (2001). Web surveys: Perceptions of burden. *Social Science Computer Review* 19(2): 146–162.

Curtin, R., Presser, S., and Singer, E. (2000). The effects of response rate changes on the index of consumer sentiment. *Public Opinion Quarterly* 64: 413–428.

De Leeuw, E., and Heer, W. (2002). Trends in household survey nonresponse: A longitudinal and international comparison. In: Groves, R. M., Dillman, D. A., Eltinge, J. L., and Little, R. J. A. (eds.), *Survey Nonresponse*, John Wiley & Sons, New York.

Dey, E. (1997). Working with low survey response rates: The efficacy of weighting adjustments. *Research in Higher Education* 38(2): 215–227.

Dommeyer, C. J., and Moriarty, E. (2000). Comparing two forms of an email survey: Embedded vs. attached. *International Journal of Market Research* 42(1): 39–50.

Evans, R., and Donnerstein, E. (1974). Some implications for psychological research of early versus late term participation by college students. *Journal of Research in Personality* 8: 102–109.

Goyder, J. (1982). Further evidence on factors affecting response rates to mailed questionnaires. *American Sociological Review* 47(4): 550–553.

Goyder, J. (1986). Surveys on surveys: Limitations and potentialities. *Public Opinion Quarterly* 50(1): 27–41.

Goyder, J. (1987). *The Silent Minority: Nonrespondents in Sample Surveys*, Westview Press, Boulder.

Goyder, J., Warriner, K., and Milller, S. (2002). Evaluating socio-economic status (SES) bias in survey nonresponse. *Journal of Official Statistics* 18(1): 1–11.

Greene, W. H. (1997). *Econometric Analysis*, Prentice Hall, Upper Saddle River, NJ.

Groves, R. M., Cialdini, R. B., and Couper, M. P. (1992). Understanding the decision to participate in a survey. *Public Opinion Quarterly* 56: 475–495.

Groves, R. M., and Couper, M. P. (1996). Contact-level influences on cooperation in face-to-face surveys. *Journal of Official Statistics* 12(1): 63–83.

Groves, R. M., Singer, E., and Corning, A. (2000). Leverage-saliency theory of survey participation. *Public Opinion Quarterly* 64: 299–308.

Heberlein, T. A., and Baumgartner, R. (1978). Factors affecting response rates to mailed questionnaires: A quantitative analysis of the published literature. *American Sociological Review* 43(4): 447–462.

Holland, J. L. (1966). *The Psychology of Vocational Choice*, Blaisdell, Waltham, MA.

Holland, J. L. (1985). *Making Vocational Choices*, Prentice-Hall, Englewood Cliffs, NJ.

Hutchinson, J., Tollefson, N., and Wigington, H. (1987). Response bias in college freshman's response to mail surveys. *Research in Higher Education* 26(1): 99–106.

Johnson, J. S., and Mowrer, R. R. (2000). Mail surveys among college students: Do initial responders score differently from nonresponders on the 16PF? *Psychological Reports* 86: 901–908.

Kaldenberg, D. O., Koenig, H. F., and Becker, B. W. (1994). Mail survey response rate patterns in a population of the elderly: Does response deteriorate with age? *Public Opinion Quarterly* 58(1): 68–76.

Kandel, D., and Raveis, J. L. (1983). Sex differences in the characteristics of members lost to a longitudinal panel: A speculative research note. *Public Opinion Quarterly* 47(4): 567–575.

Kojetin, B. A., Borgida, E., and Snyder, M. (1993). *Survey Topic Involvement and Nonresponse Bias*. Paper presented at the Proceeding of the Section on Survey Research Method, Volume II, American Statistical Association.

Kuh, G. D. (2003). *The National Survey of Student Engagement: Conceptual Framework and Overview of Psychometric Properties*, Indiana University Center for Postsecondary Research, Bloomington, IN.

Kwak, N., and Radler, B. (2002). A comparison between mail and web surveys: Response pattern, respondent profile, and data quality. *Journal of Official Statistics* 18(2): 257–273.

Lahaut, V. M. H. C. J., Jansen, H. A. M., van de Mheen, D., Garretsen, H. F. L., Verdurmen, J. E. E., and van Dijk, A. (2003). Estimating non-response bias in a survey on alcohol consumption: Comparison of response waves. *Alcohol and Alcoholism* 38: 128–134.

Larson, L. M., Rottingham, P. J., and Borgen, F. (2002). Meta-analysis of big six interests and big five personality factors. *Journal of Vocational Behavior* 61: 217–239.

Laurie, H., Smith, R., and Scott, L. (1999). Strategies for reducing nonresponse in a longitudinal panel survey. *Journal of Official Statistics* 15(2): 269–282.

Liberty, H. J. (1993). The relationship between extraversion and time of data collection. *Personality and Individual Differences* 14: 835–836.

Lin, I.-F., and Schaeffer, N. C. (1995). Using survey participants to estimate the impact of nonparticipation. *Public Opinion Quarterly* 59: 236–258.

Long, J. S. (1997). *Regression Models for Categorical and Limited Dependent Variables*, Sage Publications, Thousand Oaks, CA.

Lowe, F., and McCormick, T. C. (1955). Some Survey Sampling Biases. *Public Opinion Quarterly* 19: 303–315.

McCrae, R. R., and Costa, P. T. J. (1996). Toward a new generation of personality theories: Theoretical contexts for the five-factor model. In: Wiggins, J. S. (ed.), *The Five-Factor Model of Personality:Theoretical Perspectives*, Guilford, New York, pp. 51–87.

McDaniel, S. W., Madden, C. S., and Verille, P. (1987). Do topic differences affect survey non-response? *Journal of the Market Research Society* 29: 55–66.

Moore, D. L., and Tarnai, J. (2002). Evaluating nonresponse error in mail surveys. In: Groves, R. M., Dillman, D. A., Eltinge, J. L., and Little, R. J. A. (eds.), *Survey Nonresponse*, John Wiley & Sons, New York, pp. 197–211.

Mount, M. K., Barrick, M. A., Scullen, S. M., and Rounds, J. (2004, April 2004). *Higher Order Dimensions of Personality Traits and Interests*. Paper presented at the Annual meeting of the Society for Industrial and Organizational Psychology, Chicago.

National Center for Education Statistics (2002). *National Postsecondary Student Aid Study 1999–2000 (NPSAS:2000), CATI Nonresponse Bias Analysis Report (No. 2002–03)*, Washington, DC.

National Survey of Student Engagement (2003). *The College Student Report: 2003 Overview*.

Pealer, L. N., Weiler, R. M., Pigg, R. M. Jr., Miller, D., and Dorman, S. M. (2001). The feasibility of a web-based surveillance system to collect health risk data from college students. *Health Education & Behavior* 28(5): 547–559.

Porter, S. R., and Umbach, P. D. (2002). *College Major Choice: An Analysis of Person-Environment Fit*. Paper presented at the Association for Institutional Research, Toronto, Canada.

Porter, S. R., and Umbach, P. D. (2004). What works best? Collecting alumni data with multiple technologies. *AIR Professional File* 90: 1–10.

Porter, S. R., and Whitcomb, M. E. (2003a). The impact of contact type on web survey response rates. *Public Opinion Quarterly* 67(4): 579–588.

Porter, S. R., and Whitcomb, M. E. (2003b). The impact of lottery incentives on student survey response rates. *Research in Higher Education* 44(4): 389–407.

Porter, S. R., Whitcomb, M. E., and Weitzer, W. H. (2004). Multiple surveys of students and survey fatigue. In: Porter, S. R. (ed.), *Overcoming Survey Research Problems, New Directions for Institutional Research (Vol. 121)*, Jossey-Bass, San Francisco.

Roman, R. J., Moskowitz, G. B., Stein, M. I., and Eisenberg, R. F. (1995). Individual differences in experiment participation: Structure, autonomy, and the time of semester. *Journal of Personality* 63: 113–138.

Sax, L. J., Gilmartin, S. K., and Bryant, A. N. (2003). Assessing response rates and nonresponse bias in web and paper surveys. *Research in Higher Education* 44(4): 409–432.

Sax, L. J., Lindholm, J. A., Astin, A. W., Korn, W. S., and Mahoney, K. M. (2001). *The American Freshman:National Norms for Fall 2001*, Higher Education Research Institute, UCLA, Los Angeles, CA.

Singer, E., Groves, R. M., and Corning, A. D. (1999). Differential incentives:Beliefs about practices, perceptions of equity, and effects on survey participation. *Public Opinion Quarterly* 63: 251–260.

Singer, E., van Hoewyk, J., and Maher, M. P. (2000). Experiments with incentives in telephone surveys. *Public Opinion Quarterly* 64: 171–188.

Smart, J. C., Feldman, K. A., and Ethington, C. A. (2000). *Academic Disciplines:Holland's Theory and the Study of College Students and Faculty*, Vanderbilt University Press, Nashville.

Smith, T. W. (1995). Trends in nonresponse rates. *International Journal of Public Opinion Research* 7: 157–171.

Smith, K., and Bers, T. (1987). Improving alumni survey response rates: An experiment and cost-benefit analysis. *Research in Higher Education* 27 (3): 218–226.

Steeh, C. G. (1981). Trends in nonresponse rates, 1952–1979. *Public Opinion Quarterly* 59: 66–77.

Stevens, C. D., and Ash, R. A. (2001). The conscientiousness of students in subject pools: Implications for "laboratory" research. *Journal of Research in Personality* 35: 91–97.

Stinchcombe, A. L., Jones, C., and Sheatsley, P. (1981). Nonresponse bias for attitude questions. *Public Opinion Quarterly* 45(3): 359–375.

Tuckel, P., and O'Neill, H. (2002). The vanishing respondent in telephone surveys. *Journal of Advertising Research* 26–48.

Umbach, P. D., and Porter, S. R. (2002). How do academic departments impact student satisfaction? Understanding the contextual effects of departments. *Research in Higher Education* 23(2): 209–233.

Van Kenhove, P., Wijnen, K., and De Wulf, K. (2002). The influence of topic involvement on mail-survey response behavior. *Psychology & Marketing* 19: 293–301.

Voigt, L. F., Koepsell, T. D., and Daling, J. R. (2003). Characteristics of telephone survey respondents according to willingness to participate. *American Journal of Epidemiology* 157: 66–73.

Whitcomb, M. E., and Porter, S. R. (2004). Email contacts: A test of complex graphical designs. *Social Science Computer Review* 22(3): 370–376.

Zelenski, J. M., Rusting, C. L., and Larsen, R. J. (2000). *Personality Differences and Consistency in the Time of Experiment Participation*. Paper presented at the Poster presented at The Annual Meeting of the Society for Personality and Social Psychology, Nashville, TN.

Zusman, B. J., and Duby, P. (1987). An evaluation of the use of monetary incentives in postsecondary survey research. *Journal of Research and Development in Education* 20(4): 73–78.