USING DATABASE OVERLAYS TO CORRECT SURVEY NON-RESPONSE BIAS

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Synopsis

Using three different studies, the paper demonstrates that by merging a large scale national data base with survey respondent and non-respondent name and address files, characteristics which distinguish these two groups can be identified. The respondent sample can then be weighted to adjust for some of the bias of non-response.

Background

As many are no doubt aware, survey response rates have been dropping in the United States at an alarming rate, and interest in the subject may be at an all time high. Witness the 1998 publication of a book on the subject by Groves and Couper, and the Census Bureau's fear that the response rate to their mailed questionnaires for the next census could be as low as 60%. To counter this problem they have proposed that the advertising budget for the 2000 census be increased from 100 million to 300 million dollars. And just a few days ago there was a three and a half day International Conference on Survey Non-response in Portland, Oregon. The conference was cosponsored by five United States survey research organizations.*

The Wall Street Journal, like all other responsible users of survey research, is much concerned about the response rate problem. Because we generally know little about those who do not respond to our surveys, there is the suspicion that those who do not respond may be different in important ways from those who do, resulting in findings which are somehow biased.

At the heart of the concern over low response rates is recognition of the fact that response rates are not the same across all population segments, and it is this inequity which could result in biased survey results. Ironically, however, as a general rule, except for the total sample, such response rates cannot be calculated since we know little or nothing about those who were not interviewed.

Large Scale Databases

In thinking about this problem we came to the realization that we have a lot to learn from the direct marketing industry. Although their reasons are different, they too are interested in maximizing response rates, and they too need to know what distinguishes those who respond from those who do not.

To accomplish these goals, the direct marketing industry sometimes uses large scale databases, some of which contain information on up to 95% of U. S. households. The Journal's circulation department happens to subscribe to one of these - The Acxiom Consumer InfoBase.

To address the non-response problem we merged the Acxiom database file with the mail-out files of three mail subscriber studies. The Acxiom-compiled demographic, lifestyle and other characteristics of the respondents were then compared with those of the non-respondents.

Incidentally, and by coincidence - we didn't know it when this project was conceived - this procedure is quite similar to the one described in the book mentioned earlier, in which U. S. Census individual household data were merged with individual respondent data from other government surveys to identify the characteristics of non-respondents.

Response Rates By Segment

Before proceeding further we should point out that nearly half of Journal subscribers receive their subscription copies at their places of business rather than at home. Moreover, because Acxiom does not report individual data for those for whom a business address is available, it was necessary to separate the mail-out file into two groups: those with a home address and those with a business address. Table 1 shows the response rates and sizes of mail-out for two recently completed Journal subscriber studies - one conducted in 1995 and a second conducted in 1999. The '95 study is shown on the left.

* (1) American Association for Public Opinion Research
  (2) American Statistical Association
  (3) Council of American Survey Research Organizations
  (4) Council for Marketing and Opinion Research
  (5) International Association of Survey Statisticians

Table 1

RESPONSE RATES BY ADDRESS TYPE

	'95 WSJ % (Base)	'99 WSJ % (Base)
Home address	60.1 (6888)	50.4 (4855)
Business address	47.9 (5482)	35.1 (4146)
Total mail-out	55.7 (12370)	43.3 (9001)

This table as well as those which follow should be read as follows: For the 1995 Journal study a total of 6888 questionnaires were sent to a household address and 5482 were sent to a business. The overall rate response rate for the 1995 study was 55.7%, but the household response rate was 60.1% compared with 47.9% for the business mailing.

Note also that the response rate for the '99 study appears to be significantly lower than the rate for the '95 study. The reason is that in order to make the deadline for submission of this paper, receipt of the questionnaires for the '99 study was temporarily suspended although questionnaires were still being returned. At the time of this writing the response rates had reached 47.5% and continued to climb. Although about ten points lower, the '99 study showed the same pattern of response rate as did the '95 study - a much lower response for the business addressed sample.

To this point the Journal had never calculated response rates separately by type of mailing address, but now it was clear that we should do so and weight the data accordingly.

The rest of the analysis includes a third publication, Smart Money. It ignores type of address, because virtually all of the Smart Money subscribers receive their copies at their home address.

The Journal had always been concerned over the fact that as many as a quarter of those responding to their mail studies claim to be retired, and our analysis of the Acxiom data explains why. Table 2 shows clearly that in all three studies, those whom Acxiom had classified as retired generated much higher response rates than those who were classified as employed. And those whose retirement status was unknown had lower response rates still. The employment status of these respondents was unknown, either because Acxiom could not identify someone having that name and address (about 5% of the total mail-out), or because the employment information was not available for this individual.

Table 2

HOUSEHOLD RESPONSE RATES BY ACXIOM EMPLOYMENT STATUS

Acxiom Classification	'95 WSJ % (Base)	'99 WSJ % (Base)	'98 SM % (Base)
Retired	75.3 (908)	70.1 (598)	59.2 (211)
Employed	61.6 (2402)	52.9 (1901)	49.7 (932)
Unknown	55.3 (3578)	43.3 (2356)	40.6 (808)
All home addresses mailed	60.1 (6888)	50.3 (4855)	46.8 (2001)

Consistent with the fact that retirees had higher response rates than others as can be seen in Table 3, those of retirement age (age 66+) also had higher response rates than had others. Also consistent with these facts is the fact shown in Table 4, that those without children were more likely to return the questionnaire.

Table 3

HOUSEHOLD RESPONSE RATES BY ACXIOM AGE OF SUBSCRIBER

Acxiom Classification	'95 WSJ % (Base)	'99 WSJ % (Base)	'98 SM % (Base)
Age 66+	70.3 (2040)	64.4 (1333)	55.3 (368)
Age 18 -65	55.8 (3511)	44.7 (2872)	46.6 (1487)
Unknown	55.9 (1340)	46.7 (650)	36.3 (146)
All home addresses mailed	60.1 (6888)	50.3 (4855)	46.8 (2001)

Table 4

HOUSEHOLD RESPONSE RATES BY ACXIOM PRESENCE OF CHILDREN

Acxiom Classification	'95 WSJ % (Base)	'99 WSJ % (Base)	'98 SM % (Base)
No children	71.4 (1187)	63.4 (994)	59.3 (440)
Children present	58.2 (1310)	45.4 (1013)	43.6 (576)
Unknown	57.6 (4391)	47.5 (2848)	43.0 (985)
All home addresses mailed	57.7 (6888)	50.3 (4855)	46.2 (2001)

One of the data elements included in the Acxiom database are the responses to a check list of interests and activities taken from warranty card returns. The Acxiom file allows us to classify each household as having returned a warranty card and completed the check list or not. Table 5 contrasts the response rates for those subscribers for whom a completed check list was available with those for whom it was not. For all three studies, the subscriber study questionnaire response rates were much higher when a check list was completed than when it was not. In other words, people who do not return warranty cards tend also not to return other mail questionnaires.

Table 5

HOUSEHOLD RESPONSE RATES BY PRESENCE OF ACXIOM LIFESTYLE DATA

Acxiom Classification	'95 WSJ % (Base)	'99 WSJ % (Base)	'98 SM % (Base)
Data present	70.7 (2349)	59.7 (1908)	56.9 (902)
Data absent	54.6 (4539)	44.3 (2947)	38.4 (1099)
All home addresses mailed	60.1 (6888)	50.3 (4855)	46.7 (2001)

Finally, Table 6 compares the survey response rates for those whom Acxiom had classified as having previously responded to a direct mail solicitation with those for whom Acxiom had no such record. As might have been expected, those whom Acxiom had identified as mail responders were consistently more likely to respond to our survey questionnaires than were those which Acxiom had not classified in this way. Although these may seem obvious findings the important point is that because of the Acxiom database we now know who these people are.

Table 6

HOUSEHOLD RESPONSE RATES BY ACXIOM DIRECT MAIL RESPONSE

Acxiom Classification	'95 WSJ % (Base)	'99 WSJ % (Base)	'98 SM % (Base)
Direct mail responders	63.1 (4420)	54.0 (3397)	49.7 (1534)
Non-responders	54.8 (2468)	42.0 (1458)	37.3 (467)
All home addresses mailed	60.1 (6888)	50.3 (4855)	46.8 (2001)

To sum up, according to Acxiom, responders to the three mail surveys are noticeably different from non-responders. They are older, more likely to be retired, less likely to have children at home and more likely to respond to direct mail solicitations and return warranty cards.

Accuracy of Acxiom Data

But is the Acxiom data accurate? In order to answer this question we cross tabulated the data from Tables 2, 3 and 4 by the corresponding respondent data from the subscriber survey questionnaires. Tables 1-6 showed the response rates for the three studies both in total and by various segments within. Tables 7-9 will show the survey percentages for the same three variables shown in tables 2, 3 and 4.

Table 7

SURVEY PERCENTAGES AGE 65 OR MORE

Acxiom Classification	'95 WSJ % (Base)	'99 WSJ % (Base)	'98 SM % (Base)
Age 66+	87.6 (1435)	96.0 (854)	96.6 (208)
Age 18 - 65	5.4 (1960)	10.2 (1290)	3.7 (675)
Age unknown	31.6 (747)	32.8 (301)	15.4 (52)
All home respondents	38.6 (4142)	43.0 (2445)	24.9 (935)

The Acxiom classifications are shown in the left most column and the survey percentages for the categories defined in each table title are shown for the three surveys in the three right hand columns.

Tables 7-9 should be read as in the following example from table 7. Of the 1435 respondents whom Acxiom had classified as 66 or more in the '95 Journal study, 87.6% of the survey respondents said they were age 65 or more. (This one year difference between age 65 and age 66 is attributed to an inconsistency in the age breaks reported by Acxiom and those in the survey questionnaires.)

In contrast only 5.4% of those whom Acxiom had classified as 18-65 reported their age as 65 or more; and among those respondents for whom Acxiom had no age data, 31.6% reported their age as 65 or more. The same pattern of results was found for the '99 Wall Street Journal and Smart Money studies.

Table 8 shows the percentages of survey respondents who classified themselves as retired when asked their employment status. A pattern of results similar to those observed in Table 7 was found: 90.1% of those in the '95 Journal study whom Acxiom had classified as retired also reported themselves as such in the mail survey. Among the 1479 respondents whom Acxiom had classified as employed, 25.1% called themselves retired.

Table 8

SURVEY RETIREMENT PERCENTAGES

Acxiom Classification	'95 WSJ % (Base)	'99 WSJ % (Base)	'98 SM % (Base)
Retired	90.1 (684)	89.8 (419)	92.5 (125)
Employed	25.1 (1479)	27.5 (1005)	20.5 (463)
Unknown	34.2 (1979)	34.2 (1021)	26.0 (347)
All home respondents	40.2 (4142)	40.9 (2445)	32.0 (935)

Only the Smart Money questionnaire contained a question about the presence or absence of children. For this reason table 9 contains data regarding absence of children for the Smart Money study only. Again, high levels of agreement are found.

Table 9

SURVEY ABSENCE OF CHILDREN PERCENTAGES

Acxiom Classification	'98 SM % (Base)
No Children	97.7 (261)
Children Present	30.1 (251)
Unknown	83.7 (423)
All Home Respondents	73.3 (935)

Sample Balancing

Having satisfied ourselves that the Acxiom data are reasonably accurate, and that they can distinguish between those who responded to these three surveys and those who did not, the next step was to sample balance using the Deming algorithm and weight the data using the five Acxiom variables which distinguished the respondents from the non-respondents. We also weighted the sample so that the business addressed and home addressed respondents were represented in the same proportions as in the total mail-out.

Table 10

'95 WSJ
UNWEIGHTED Vs WEIGHTED SURVEY RESULTS

Survey Classification	Unweighted (N = 6766) %	Weighted (N = 12370) %	Diff ± %
Retired	26.1	22.0	-4.1
Age 65+	26.9	23.0	-3.9

We then retabulated the weighted age, occupation and presence of children data for the three subscriber surveys. Table 10 compares the weighted with the unweighted data using the '95 Journal study. The weighted data reduced the percentages of retired and age 65 or more respondents by about four percentage points as shown in the right hand column. In the case of the '99 study the reduction was about six percentage points (Table 11), and in the case of the Smart Money study the difference between the weighted and unweighted data was about three percentage points (Table 12).

Table 11

'99 WSJ
UNWEIGHTED Vs WEIGHTED SURVEY RESULTS

Survey Classification	Unweighted (N = 3899) %	Weighted (N = 9000) %	Diff ± %
Retired	27.5	21.3	-6.2
Age 65+	31.1	24.8	-6.3

Table 12

' 98 SMART MONEY
UNWEIGHTED Vs WEIGHTED SURVEY RESULTS

Survey Classification	Unweighted (N = 935) %	Weighted (N = 1998) %	Diff. ± %
Retired	32.0	28.6	-3.4
Age 65+	24.9	21.6	-3.3
No children	73.3	70.2	+3.1

Conclusion

In presenting these data we wish to make three points:

1. The availability of large scale marketing databases affords us the opportunity to contrast characteristics of those who respond to a particular survey with those who do not.
2. Cross tabulation of the database characteristics of those who responded to the survey with their questionnaire responses can assure us that the database file is reasonably accurate.
3. By sample balancing the respondent file to the mail-out file of respondents and non- respondents on those variables which distinguish them, a weighting system can be developed to remove some of the bias caused by the non-response.

In the present instance the respondents were older than the non-respondents. They were more likely to be retired and not to have children living at home. They were more likely to respond to direct mail solicitations and more likely to complete warranty card questionnaires. They were also less likely to receive their copies at their places of business.

Other surveys have been shown to have different patterns of non-response. For example, in a 1992 study by Appel and Baim using MRI personal interview data and the PRIZM system of geodemographics, the respondents were found to be younger - not older as in this case. Non-response bias may very well vary by survey depending upon the method of interviewing and survey content.

For this reason we suggest that consideration be routinely given to applying the steps outlined here to all surveys. Speaking of the 1999 Wall Street Journal subscriber survey, the published results will be appropriately weighted, and we hope that other publications doing their own studies will consider doing the same.

References

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