## APPENDIX H

## B&B:08/12 Exploration of Responsive Design[[1]](#footnote-1)

## Methods

Two types of statistical distancing measures were considered to reduce nonresponse bias:

* R-indicator – The R-indicator measures the extent to which the response probabilities vary. The idea is that nonresponse bias depends critically on the contrast between the characteristics of respondents and nonrespondents.
	+ Based on the standard deviation of the response propensities and on covariates known for respondents and nonrespondents.
	+ Group-level measure.
	+ Partial R-indicators used to identify which subgroups are less representative and could be targeted during data collection.
* Mahalanobis distance (M) – A comparison between the baseline average of covariates that are known for both respondents and nonrespondents.
	+ Based on covariates known for respondents and nonrespondents.
	+ Person-level measure.
* Both measures are highly correlated with response propensity, so we focused on R because we found more in the literature discussing how to use R to increase the representativeness in survey samples.

## Exploration using B&B:09 data

* Using data obtained from the B&B:09 full-scale study (prior wave for same cohort), we computed R and M.
* We computed R after each month of data collection using the response indicator at that point in time as the dependent variable.
* We used the covariates we already have coded from previous work.
* R decreases initially and then increases to end at about the same point as the initial value of R. The bias decreases over time (see table 1 and figure 1).
* R and M are not comparable since R is at the group-level and M is at the person-level. We decided not to take the time to simulate M.
* We looked at correlations between the model variables and the outcome measures. The bivariate correlations were mostly below .2 and the aggregate correlation was around .4.
* We performed two simulations for the computation of R.
	+ Based on partial R’s, targeted base year nonrespondents and hard to locate cases.
	+ First simulation:
		- Nonrespondents after 3 months of data collection in B&B:09, were classified in the simulation to be final respondents or nonrespondents with their probability of being a respondent or nonrespondent based on their propensity score. This assignment of respondent or nonrespondent was simulated 1,000 times with the results shown below based on the average.
		- The propensity of the targeted group was increased by 0, 10, 20, 30, 40, and 50 percent. The propensity of the non-targeted groups was decreased by the same percentage (although we do not plan to do this in practice).
		- R increased as propensity increased up to 40 percent and then decreased (see figure 2).
	+ Second simulation:
		- Only actual respondents were used, so that outcome measures could be computed.
		- Nonrespondents in the targeted group after 3 months who became respondents by the end of the 9 month data collection period (n=600), were randomized for this simulation to be classified as final respondents or nonrespondents. This randomization was simulated 500 times with the results shown below based on the average.
		- The percentage of the cases that was treated as nonrespondents was varied in the simulations from no cases changing from respondent to nonrespondent up to all targeted cases changing.
		- R decreased as less cases in the target group were respondents (see figure 3).
		- 3 of 26 outcome measures changed significantly with the target group excluded (see table 2).

## B&B:12 full-scale recommendations

* We recommend using the R-indicator for B&B:12.
* R is good for studies like B&B where there are a lot of data known for respondents and nonrespondents, for which a good model can be developed.
* We will monitor R on a regular basis and evaluate R and the partial R’s at three points in data collection to determine how to change the data collection for a targeted group.
* We plan to re-visit the model to see what additonal paradata could be added and to explore any additonal variables, including demographics, to add.
* The R-indicator cannot be used alone because sample yield targets (based on precision requirements) must also be taken into account during data collection.
* We could later explore using an individual-level measure within subgroups to prioritize cases for certain data collection treatments.
* Given that we don’t know exactly how well the R-indicator will work to reduce bias and limitations of our simulations, we recommend implementing an experiment.
* Experiment plans:
	+ Starting out with a 17,000 sample.
	+ We’re proposing either a 1:3 or 1:1 treatment-to-control ratio (randomly assigned).
	+ Control group will be exposed to the same monetary & non-monetary toolbox as our field-test sample.
	+ Treatment group will be exposed to varied intensity levels of these incentive tools based on their representativeness (partial R-indicator), (e.g. treatment cases in the targeted group will receive the targeted interventions).
	+ Incentive tools include
		- Date at which outbound calling begins;
		- Date at which case is sent to intensive tracking and tracing;
		- Date at which abbreviated interview is offered; and
		- Monetary incentive increase (base of $20/$35/$50 + added amt of $15).

**Table 1. Summary of R-indicator by month – B&B:08/09 data**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Month** | **R- indicator** | **Response rate** | **Bias** | **Contrast** | **Average propensity-overall** | **Average propensity - respondents** | **Average propensity - nonrespondents** |
| 1 | 0.636 | 0.353 | 0.654 | 0.906 | 0.278 | 0.396 | 0.237 |
| 2 | 0.432 | 0.599 | 0.602 | 1.140 | 0.472 | 0.643 | 0.329 |
| 3 | 0.403 | 0.642 | 0.590 | 1.193 | 0.505 | 0.682 | 0.335 |
| 4 | 0.376 | 0.697 | 0.565 | 1.261 | 0.552 | 0.728 | 0.344 |
| 5 | 0.486 | 0.750 | 0.406 | 1.105 | 0.633 | 0.731 | 0.467 |
| 6 | 0.509 | 0.798 | 0.358 | 1.139 | 0.685 | 0.769 | 0.509 |
| 7 | 0.544 | 0.837 | 0.311 | 1.162 | 0.732 | 0.800 | 0.556 |
| 8 | 0.597 | 0.855 | 0.264 | 1.114 | 0.763 | 0.815 | 0.606 |
| 9 | 0.634 | 0.877 | 0.230 | 1.113 | 0.793 | 0.834 | 0.647 |

**Figure 1. Summary of R-indicator by month – B&B:08/09 data**

**Figure 2. Summary of R-indicator by change in propensity - simulation 1**

**Figure 3. Summary of R-indicator by change in respondents - simulation 2**

**Table 2. Summary of outcome measures by change in respondents - simulation 2**

|  |  |
| --- | --- |
| **Outcome measure** | **Change in response** |
| **None** | **10 percent** | **50 percent** | **All** |
| Bachelor’s degree major – STEM major | 0.164(0.158, 0.170) | 0.164(0.163, 0.165) | 0.164(0.163, 0.166) | 0.165(0.164, 0.166) |
| Cumulative undergraduate grade point average (multiplied by 100, mean) | 326.252(325, 327.5) | 326.366(326.2, 326.5) | 326.843(326.7, 327) | 327.496(327.3, 327.7) |
| First institution sector – 2-year or less | 0.298(0.287, 0.31) | 0.299(0.298, 0.3) | 0.302(0.301, 0.304) | 0.307(0.305, 0.308) |
| Number of institutions attended before bachelor’s completion | 0.551(0.538, 0.564) | 0.552(0.551, 0.554) | 0.558(0.556, 0.559) | 0.565(0.563, 0.567) |
| Time to 2007-08 bachelor’s degree (mean time in months) | 78.716(76.8, 80.6) | 78.783(78.6, 79) | 79.027(78.8, 79.2) | 79.399(79.2, 79.6) |
| Cumulative total amount borrowed (mean) | 16,299.182(15,843, 16,755) | 16,390.570(16,346, 16,435) | 16,770.800(16,726, 16,815) | 17,302.090(17,258, 17,346) |
| Cumulative amount owed as of 2008-09 (mean) | 15,840.598(15,365, 16,317) | 15,937.050(15,890, 15,984) | 16,336.050(16,289, 16,383) | 16,896.750(16,850, 16,944) |
| Cumulative federal amount borrowed (mean) | 11,304.202(10,992, 11,616) | 11,355.670(11,317, 11,394) | 11,569.230(11,530, 11,608) | 11,867.670(11,829, 11,906) |
| Debt burden in 2008-09 (mean) | 3.408(3.098, 3.718) | 3.432(3.393, 3.471) | 3.529(3.49, 3.567) | 3.668(3.629, 3.707) |
| Ever received Pell grant | 0.372(0.358, 0.385) | 0.373(0.371, 0.375) | 0.377(0.376, 0.379) | 0.383(0.382, 0.385) |
| Loan status in 2008-09 – not repaying | 0.178(0.168, 0.187) | 0.179(0.177, 0.18) | 0.182(0.181, 0.183) | 0.187(0.186, 0.188) |
| Enrollment status in degree program in 2009 – master’s | 0.011(0.0085, 0.0136) | 0.011(0.0106, 0.0113) | 0.011(0.0104, 0.0112) | 0.011(0.0101, 0.0109) |
| Highest degree program enrollment after bachelor’s degree, as of 2009 – master’s | 0.194(0.184, 0.204) | 0.194(0.193, 0.195) | 0.194(0.193, 0.196) | 0.195(0.194, 0.196) |
| Number of jobs held since bachelor’s degree – one | 0.501(0.489, 0.514) | 0.501(0.499, 0.503) | 0.500(0.498, 0.502) | 0.498(0.496, 0.5) |
| Employment status in 2009 – one job | 0.703(0.692, 0.714) | 0.703(0.701, 0.704) | 0.703(0.701, 0.704) | 0.702(0.701, 0.704) |
| Satisfied with employment in 2009 – compensation | 0.558(0.549, 0.572) | 0.558(0.556, 0.56) | 0.557(0.555, 0.559) | 0.556(0.554, 0.558) |
| Employer benefits in 2009 offered medical or health insurance | 0.763(0.752, 0.774) | 0.762(0.761, 0.764) | 0.761(0.76, 0.762) | 0.759(0.757, 0.76) |
| Earned income in 2009 (mean) | 29,139.719(28,526, 29,753) | 29,099.780(28,993, 29,206) | 28,949.940(28,843, 29,057) | 28,731.680(28,625, 28,838) |
| Job not part of career in industry | 0.165(0.153, 0.177) | 0.165(0.163, 0.166) | 0.166(0.164, 0.167) | 0.167(0.165, 0.168) |
| Job unrelated to major | 0.272(0.259, 0.284) | 0.272(0.27, 0.273) | 0.273(0.271, 0.274) | 0.275(0.273, 0.276) |
| Highest education attained by either parent – bachelor’s degree | 0.260(0.25, 0.271) | 0.260(0.259, 0.262) | 0.260(0.259, 0.262) | 0.260(0.259, 0.262) |
| Age at bachelor’s degree receipt (mean) | 25.273(25.08, 25.46) | 25.278(25.26, 25.3) | 25.297(25.28, 25.32) | 25.326(25.31, 25.35) |
| Has disability in 2007-08 | 0.082(0.075, 0.089) | 0.082(0.081, 0.083) | 0.082(0.081, 0.083) | 0.082(0.081, 0.083) |
| Marital status and dependents – unmarried with no dependents | 0.653(0.64, 0.666) | 0.652(0.651, 0.654) | 0.650(0.649, 0.652) | 0.647(0.646, 0.649) |
| Volunteered in last 12 months as of 2009 | 0.409(0.397, 0.421) | 0.409(0.407, 0.41) | 0.407(0.406, 0.409) | 0.406(0.404, 0.408) |
| Ever voted as of 2009 | 0.875(0.866, 0.883) | 0.875(0.874, 0.876) | 0.876(0.875, 0.877) | 0.878(0.877, 0.879) |

Note: Highlighted variables show a significant difference between the “None” and “All” columns.

1. These findings were originally presented to representatives from NCES and OMB on 2/7/2012. The recommendations in this document have been superseded by those in Part B. [↑](#footnote-ref-1)