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From: MacKay, Charles (NIH/OD)

Sent: Friday, November 19, 2004 9:34 AM

To: John_Kraemer@omb.eop.gov

Cc: Brian_A._Harris-Kojetin@omb.eop.gov; Hesse, Bradford (NIH/NCI); Ragland-Greene, Rachelle (NIH/NCI); 'Holly Schiffrin'; Currie, Mikia (NIH/OD)

Subject: Response to HINTS II

Good Morning, John,
I am forwarding the response from program on the above pending request. Thanks to you and Brian for your efforts to clarify and to ensure the greater utility of the information collection. Let me know if you require further input. I am sure that Brad would appreciate hearing from Brian about the statistical group.
Charles

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MEMORANDUM

TO: Brad Hesse

November 18, 2004

FROM: Holly Schiffrin

SUBJECT: Response to OMB Questions about HINTS II

As followup to the November 16, 2004 teleconference with OMB, I have researched the following items and drafted a response. The outstanding questions relate to three primary areas including (1) disclosure analysis, (2) sampling issues, and (3) the experimental procedures. Each of these will be described in further detail.

Disclosure Analysis

We investigated the materials reviewed in preparation for the release of HINTS I data, and confirmed that Working Paper #22, Report on Statistical Disclosure Limitation Methodology served as the primary reference for decisions related to ensuring confidentiality in the public use database. This paper, in conjunction with the Checklist on Disclosure Potential of Proposed Data Releases, will inform the release of HINTS II data as well.

Sampling Issues

- **Subsampling Nonmailable Households.** Westat will exclude 31.3% of the nonmailable households from the sample. Attachment A describes the analyses conducted to determine the optimal percentage to exclude.

- **Non-response Adjustments and Response Rate Calculations.** The approach to non-response adjustments and response rate calculations for HINTS II will be similar to the approach used in HINTS I. For response rates, we will use AAPOR's RR3 formula to calculate response rates. This formula includes a portion of the eligibility unknowns (i.e., an estimated number of eligible cases among the unknowns) in the denominator. The approach to non-response adjustments and response rate calculations is described in further detail in Attachment B, an excerpt from the HINTS I Sample Design and Weighting Plan. The full report is available at http://cancercontrol.cancer.gov/hints/hints_docs/sampling_plan_final.doc.

- **Attachment 7c of OMB Submission.** We confirmed with Westat's statistician that the 71% response rate was referring only to the extended interview.

Experimental Procedures

- **Field Experiment.** We have reviewed the issue related to the incentive amounts and decided to retain three levels of the experimental condition to help determine the minimum incentive that will bolster response rates. However, consistent with OMB's recommendation, we will reduce the incentive amounts to $0, $5, and $15. These amounts were selected based on a review of Trussel and Lavrakas (2004), who conducted an experiment to determine optimal incentive amounts, although the response task is different than in HINTS II and the incentives were prepaid rather than promised. These data suggest that among cooperative households[1] (i.e., those who agreed to participate in the study at initial contact) a $5 prepaid incentive resulted in a significantly higher response rate than $0 to $4. People who received $6, $7, or $10 were significantly more likely to respond than the $5 condition. However, there were no significant differences among the $6-$10 conditions. Work at Westat has also suggested that a $5 prepaid incentive is effective when conducting refusal conversion for extended interviews. Therefore, we have selected $5 as the first incentive level in order to inform the research on how an amount that is effective as a prepaid incentive works when used as a promised incentive. We have selected $15 as the second incentive level to ensure a large enough effect size to detect a difference between the incentive conditions. The power of the statistical tests for the incentive experiments is not high, especially if there is a significant interaction between the incentive and mode experiment (e.g. incentive is less effective on the telephone than on the web). Having a difference of $10 between the top two incentive levels should increase the chances that a significant effect would be detected.

- **Laboratory Experiment.** Upon OMB's recommendation to increase the delay between the pre- and post-test in the laboratory experiment, we reviewed a chapter in Biemer, Groves, Lyberg, Mathiowetz, and Sudman (1991) entitled *The Design and Analysis of Reinterview: An Overview* (Forsman & Schreiner, 1991) as well as consulted with colleagues at Westat. These resources indicated that the lag between interviews should not be "... so short that the respondent merely remembers the original response and repeats it. How long the lag can be is dependent upon the nature of the data being collected. The more the data are subject to variation, the shorter the time lag" (p. 289) should be. Therefore, we reviewed questionnaire and identified there primary reference periods including 12 months, 30 days, and a typical week. Given that the 12 month and typical week referents are fairly stable, a longer delay between interviews seems feasible and will reduce the chances that the respondent merely remembers their original response. Therefore, the delay between interviews will be increased to two weeks. We will be able to probe responses to the 30 day items to determine if changes in response are due to actual changes in behavior.

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[1] Cooperative households are similar to the population who will be completing the HINTS II extended interview because the households will have already agreed to and have completed the screener.

ATTACHMENT A. SUBSAMPLING OF THE NON-MAILABLES

Brick, Judkins, Montaquila, and Morganstein (2002) recommended the subsampling of nonmailables to increase the efficiency of the sampling process, as the nonmailables are much more costly per completed extended interview, due to lower response and residency rates. This was done in the last wave of HINTS I: the nonmailable stratum was subsampled at an 80 percent rate (i.e., 20% of these numbers were deleted from the sample).

The theory underlying this is essentially assigning optimal sampling rates to strata based on stratum sizes, stratum variability, and cost per sample unit within the strata. Defining N_h as the number of sample units in the population in stratum h, n_h as the sample size in stratum h, S_h as the population variance in stratum h, and c_h as the relative cost of completing an interview in stratum h, Cochran (1977). Section 5.5 defines the optimal sampling rate by

$$\frac{n_h}{N_h} \propto \frac{S_h}{\sqrt{c_h}}$$

In this application, we have two strata: h=1 corresponding to the mailable numbers and h=2 corresponding to the nonmailable numbers. We will compute relative rates based on setting the S_h values as equal[2]. Following the general model of Brick, et al. (2002), we can define the cost within each stratum as $C_h = n_h * c_h$, where n_h is the number of completed extended interviews, and c_h is the non-overhead cost per completed extended interview, breaking this down as follows:

$$C_h = n_h \left\{ c_{ce} + \frac{c_{re} * (1 - r_{eh})}{r_{eh}} + \frac{c_s}{r_{eh}} + \frac{c_{rs} * (1 - r_{sh})}{r_{eh} * r_{sh}} + \frac{c_{nr} * (1 - R_h)}{r_{eh} * r_{sh} * R_h} \right\}$$

c_{ce} Cost of carrying out extended interview with cooperative respondent;
c_{re} Cost of finalizing extended interview with extended interview nonrespondent;
r_{eh} Extended interview response rate in stratum h;
c_s Cost of completing screener with cooperative household;
c_{rs} Cost of finalizing screener-nonresponding households (refusal or other nonresponse);
r_{sh} Screener response rate in stratum h;
c_{nr} Cost of finalizing nonresidential telephone number;
R_h Residency rate in stratum h.

[2] This will be the case for any questionnaire items that do not differ in variability between adults in mailable and adults in nonmailable households.

Note that dividing by r_{eh} gives completed screeners, dividing by $r_{eh}*r_{sh}$ gives total residential numbers, and dividing by $r_{eh}*r_{sh}*R_h$ gives total sample numbers. The unit costs are assumed to be equal across the strata. In HINTS I, we found that the screener response rate for the nonmailable numbers was 11.5 percent less than that for the mailable numbers when $2 incentives were included in the original mailings (which we will do in HINTS II)[3]. The extended interview response rate for the nonmailable numbers was also 4 percent less under the same conditions[4]. Our overall projected rates are 65 percent for the screener response rate and 68 percent for the extended interview response rate. Using the cost formula above with the designated unit costs and designating target response rates for HINTS II for the mailable and non-mailable subsets (assuming a 4% difference for the extended response rate and a 11.5 percent difference for the screener response rate, as in HINTS I), Table C-1 presents a computation of the unit costs C_h/n_h for each stratum.

Table C-1. Relative costs for the mailable and nonmailable stratum.

		Mailable	Non-mailable
Cost of completed extended	C_{ce}	3.3	3.3
Cost of extended refusal	C_{re}	2.05	2.05
Cost of completed screener	C_{cs}	1	1
Cost of refused or other screener	C_{rs}	2.65	2.65
Cost of nonresidential	C_{nr}	0.36	0.36
Extended response rate	r_{eh}	68.80%	64.80%
Screener response rate	r_{sh}	67.90%	56.40%
Residency rate	R_h	78.00%	12.00%
Overall response	$r_{eh}*r_{sh}$	46.72%	36.55%
Cost of complete extendeds	C_{ce}	3.30	3.30
Cost of refusing extendeds	$C_{re}*(1-r_{eh})/r_{eh}$	0.93	1.11
Cost of completed screeners	C_s/r_{eh}	1.45	1.54
Cost of refusing screeners	$C_{rs}*(1-r_{sh})/(r_{eh}*r_{sh})$	1.82	3.16
Cost of finalizing nonresidentials	$C_{nr}*(1-R_h)/(r_{eh}*r_{sh}*R_h)$	0.22	7.22
Total relative cost		7.72	16.34
Cost ratio			2.12

Assuming the validity of the unit costs and response and residency rates, the ratio of the costs of completing an extended interview in the nonmailable stratum to that of the mailable stratum is 2.12. This is due to the much higher number of nonresidential numbers, and the higher number of refusals. The ratio of sampling rate of nonmailable to mailable stratum should be $1/\sqrt{2.12}$, which is 68.7 percent.

[3] 60.7% response rate for the pre-incentive, no refusal incentive Wave 1 HINTS I group, and 49.2% for the Wave 1 non-mailable group.

[4] 64.0% extended interview response rate for the pre-incentive, no refusal incentive Wave 1 HINTS I group, and 59.8% for the Wave 1 non-mailable group.

ATTACHMENT B. EXCERPT FROM THE HINTS I SAMPLING PLAN

7.0 Nonresponse Adjustment and Response Rates

Nonresponse is generally encountered to some degree in every survey. The first and most obvious effect of nonresponse is to reduce the effective sample size, which increases the sampling variance. In addition, if there are systematic differences between the respondents and the nonrespondents, there also will be a bias of unknown size and direction. This bias is generally adjusted for in the case of unit nonrespondents (nonrespondents who refuse to answer any part of the questionnaire) with the use of a weighting adjustment term multiplied to the base weights of sample respondents. Item nonresponse (nonresponse to specific questions only) is generally adjusted for through the use of imputation. This section discusses weighting adjustments for unit nonresponse, and calculations of response rates.

The most widely accepted paradigm for unit nonresponse weighting adjustment is the quasi-randomization approach (Oh and Scheuren, 1983). In this approach, nonresponse cells are defined based on those measured characteristics of the sample members that are known to be related to response propensity. For example, if it is known that males respond at a lower rate than females, then sex should be one characteristic used in generating nonresponse cells.

Under this approach, sample units are assigned to a response cell, based on a set of defined characteristics. The weighting adjustment for the sample unit is the reciprocal of the estimated response rate for the cell. Any set of response cells must be based on characteristics which are known for all sample units, responding and nonresponding. Thus questionnaire answers on the survey cannot be used in the development of response cells, because these characteristics are only known for the responding sample units.

Under the quasi-randomization paradigm, we model nonresponse as a "sample" from the population of students in that cell. If this model is in fact valid, then the use of the quasi-randomization weighting adjustment eliminates any nonresponse bias (see for example Little and Rubin (1987), Chapter 4).

7.1 Unit Nonresponse in HINTS

There will be two types of unit nonresponse in HINTS: screener nonresponse and extended interview nonresponse. Screener nonresponse occurs when a household is reached, but the screener interview is not completed. We also need to include in any screener nonresponse calculations any households for which we never reached a person, either because we only reached an answering machine (these are called NM numbers), or only got a ring with no answer (these are called NA numbers), with every call made to the telephone number. Since we don't know if an answering machine or ring no answer corresponds to a residential household, the number of lost residential numbers among the NA and NM numbers needs to be estimated (see Section 7.3 below).

To adjust for screener nonresponse, each completed screener received a screener nonresponse adjustment equal to the reciprocal of the estimated response rate in its screener nonresponse cell. For a discussion of the screener nonresponse cells and adjustments see Sections 7.2 and 7.3 respectively.

Extended interview nonresponse occurs when the screener interview is completed successfully, yielding a sampled adult in the household with identifying information for this adult, and the number of adults in the household, but the sampled adult does not complete the extended interview.

To adjust for interview nonresponse, each completed extended interview receives an interview nonresponse adjustment equal to the reciprocal of the weighted interview response rate in its interview nonresponse cell. (Completed extended interviews also receive a screener nonresponse adjustment.) The methodology for selecting extended interview nonresponse cells and computing extended interview nonresponse adjustments is discussed in Section 7.4. Section 7.5 discusses the computation of replicate nonresponse adjustments.

7.2 Nonresponse Cells for Screener Nonresponse Adjustments

Nonresponse cells will be generated using cross-classifications based on selected sociodemographic characteristics estimated for each telephone exchange (by our vendor Genesys), and mailable status (whether or not an address was available for the telephone number to send them a letter).

The estimated exchange percentages from Genesys will be used to assign each exchange to cells based on the following characteristics:

- Four cells based on geography (Census region): Northeast, South, Midwest, West;
- Three cells (with roughly equal populations)[5] by percent college graduates (exchanges with lowest percentage, next lowest percentage, and highest percentage);
- Three cells (with roughly equal populations) by median income;
- Three cells by percent blacks and Hispanics (two within the high-minority stratum, and the undivided low-minority stratum).

We judge that these characteristics may be both related to response propensity and correlated to item response to HINTS questionnaire items, so that these cells will lead to effective nonresponse adjustments.

The other characteristic for generating cells is the mailable, non-mailable status indicating whether or not a published address is available for the telephone number. These addresses will be used to mail advanced letters about the study and follow-up letters for households who have not responded. We have found in previous surveys that response propensity may differ by this characteristic (telephone households with known addresses which have received mailed information respond at a higher rate than those without known addresses).

Cross-classifications of these sociodemographic classes and the mailout status gives a potential total of 216 cells (though some of the cells may be empty). We will collapse these cells to attain a minimum cell size of 10 sample units and a maximum cell adjustment of 3.0, using our in-house COLL_ADJ software.

7.3 Screener Nonresponse Adjustments

In general, nonresponse adjustments within nonresponse cells are the reciprocals of the weighted response rates within the cell, where the respondents and nonrespondents are weighted by their (adjusted) base weight. In this case, the household base weights are unknown for screener nonrespondents, since components of the base weight depend on whether the household has one or more residential telephone numbers. For this reason, the nonresponse adjustment is set equal to the reciprocal of the unweighted screener response rate for each cell.

In principle, the unweighted screener response rate is equal to the total number of cooperating households (eligible or not) divided by the total number of residential numbers in the sample.

[5] The breakpoints will be the 1/3 and 2/3 percentiles over all frame exchanges, which will be calculated when the frame is constructed.

The latter value is not completely known, because of NM and NA numbers. Let *AMNA(a)* and *PNA(a)* be the counts of NM and NA numbers in cell *a*. We will estimate the number of residential numbers among the NM numbers by computing the overall eligibility rate *EM* among working numbers with known eligibility status, and by computing the overall eligibility rate *EA* among all numbers with known eligibility status (working and non-working).

With these two estimated eligibility rates applied to the NM and NA numbers, the nonresponse adjustment for cell *a* will be computed as follows:

$$HNRA(a) = \frac{C(a) + I(a) + REF(a) + O(a) + (AMNA(a) * EM) + (PNA(a) * EA)}{C(a) + I(a)}$$

where *C(a)* is the number of completed screeners, *I(a)* is the number of households found ineligible for the study, *REF(a)* is the number of eligible screeners who refused to participate, and *O(a)* are other residential numbers (e.g., numbers which were found to be residential, but for which a screening interview could not be completed for reasons other than refusals).

We will also compute a study screener response rate. Writing *C, I, REF, O, AMNA*, and *PNA* as the total number of completed screeners, ineligibles, eligible screeners who refused to participate, other residentials, answering machine NA's, and pure NA's respectively, and defining *EM* and *EA* as above, we will compute the screener response rate *SCRNR* as

$$SCRNR = \frac{C + I}{C + I + REF + O + (AMNA * EM) + (PNA * EA)}$$

Note that this screener response rate is algebraically equivalent to

$$SCRNR = \frac{C}{C + \{ER * [REF + O + (AMNA * EM) + (PNA * EA)]\}}$$

with $$ER = \frac{C}{C + I}$$

The second form of *SCRNR* though algebraically more complicated is conceptually more transparent. The response rate is the completes divided by the completes plus the estimated eligible numbers among the remaining residential numbers (refusals and NA's). We estimate the eligibles among the estimated residential numbers *REF+O+(AMNA*EM)+(PNA*EA)* by imputing the eligibility rate from

the 'known eligibility status' numbers: the completes and ineligibles. *SCRNR* is fully within the guidelines of AAPOR standards regarding valid response rates[6].

7.4 Extended Interview Response Cells

There is more information available about extended interview nonrespondents as compared to screener nonrespondents. This extra information comes from the completed screener (a case is not designated as an extended interview nonrespondent unless the screener is successfully completed). In this section, a screener is defined as completed if the key items for sampling an adult and assigning a base weight to the household are answered: the number of adults in the household and the presence of multiple telephone numbers. Note that only if the screener is complete are we able to compute the base weight w_i (see Section 5).

Extended interview nonresponse cells will be generated using cross-classifications of the following characteristics of the sampled adult and household:

1. Sex of sampled adult.
2. Size of household: number of adults in household (1, 2, or more than 2).
3. Census region (4 cells)
4. Telephone number in high, medium, or low minority exchange (3 cells).
5. Telephone number in high, medium, or low college educated exchange (3 cells);
6. Telephone number in high, medium, or low median income exchange (3 cells).

The first two characteristics on the list are derived directly from the screener questionnaire for the. The remaining four characteristics are derived from the telephone exchange, and are identical to those utilized in constructing screener nonresponse cells (see Section 7.2). Nonresponse cells will be constructed by collapsing the initial cells to meet the criteria that the cell sample size should be no smaller than 10 and the nonresponse adjustment should be no bigger than 3.0. This will be done using Westat's in-house software COLL_ADJ.

Weighted nonresponse adjustments will be computed for each extended interview cell b as follows:

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[6] Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys. Available on AAPOR (American Association for Public Opinion Research) website www.aapor.org.

$$ENRA(b) = \frac{\sum_{i \in SA(b)} w_i HNRA(a)}{\sum_{i \in SRA(b)} w_i HNRA(a)}$$

where w_i is the base weight for sampled adult i, *SA(b)* is the set of all sampled adults (in cooperative screeners) in interview response cell b, *SRA(b)* is the set of all sampled adults in cell b completing an extended interview (i.e., the extended interview respondents), and $HNRA(a)$ is the screener nonresponse adjustment for the screener nonresponse cell a containing household i. The denominator of *ENRA(b)* is an unbiased estimator (adjusted for screener nonresponse[7]) of the total number of adults in the nonresponse cell who would answer an extended interview if contacted (the "population respondents"), the numerator of *ENRA(b)* is an unbiased estimator of the total number of adults in the nonresponse cell (also adjusted for screener nonresponse), and *ENRA(b)* is an approximately unbiased estimator of the response rate which would be obtained in cell b if the entire U.S. population were contacted for the study.

We will also compute a weighted extended interview response rate, for reporting purposes. Write SA as the set of all sampled adults from completed screeners and SRA as the set of all sampled adults completing an extended interview. The weighted extended interview response rate is computed as follows:

$$EXTINR = \frac{\sum_{i \in SRA} w_i HNRA(a)}{\sum_{i \in SA} w_i HNRA(a)}$$

7.5. Replicate Nonresponse Adjustments

Nonresponse adjustments are themselves random variables, and contribute a variance component to the overall sampling variance. This variance component is represented in the final jackknife estimator by replicating the computation of nonresponse adjustments (by replacing the original base weights by the replicate base weights, and repeating the computations described in Sections 7.2, 7.3, and 7.4).

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[7] Under full response, the sum of the base weights is an unbiased estimator. With the presence of nonresponse, there will be nonresponse bias from any differences between the responding and nonresponding households. This nonresponse bias is reduced in magnitude by the screener nonresponse adjustments. We can't expect these adjustments to eliminate all bias, so the claim of "unbiasedness" of these totals needs to receive this caveat.

The screener nonresponse adjustments are the reciprocals of unweighted screener response rates. Replicate screener response rates were computed for each screener response cell a and each replicate r by removing the deleted set (of telephone numbers) corresponding to each replicate r and recomputing the response rate. In other words, we recomputed response rates for each replicate set as if it were the original RDD sample of telephone numbers.

Define *RS(a,r)* as the count of confirmed residential numbers in screener response cell a which are in replicate set r. (An alternative definition of *RS(a,r)* is the count of confirmed residential numbers in screener response cell a after the deleted set corresponding to replicate r has been removed from the RDD sample.) Define *AMNA(a,r), PNA(a,r), EM(r), EA(r), C(a,r), I(a,r), REF(a,r),* and *O(a,r)* similarly (see Section 7.3). Then we can define a replicate nonresponse adjustment as follows:

$$HNRA(a,r) = \frac{C(a,r) + I(a,r) + REF(a,r) + O(a,r) + \left(AMNA(a,r) * EM(r)\right) + \left(PNA(a,r) * EA(r)\right)}{C(a,r) + I(a,r)}$$

The computation of interview nonresponse adjustments will also be replicated. The replicate interview nonresponse adjustment for interview nonresponse cell b and replicate r is computed as follows:

$$ENRA(b,r) = \frac{\sum_{i \in SA(b)} w_i(r) HNRA(a,r)}{\sum_{i \in SRA(b)} w_i(r) HNRA(a,r)}$$

The two nonresponse adjustments (for screener nonresponse and extended interview nonresponse) are appended to the base weight for the subject (adult):

$$SBW_i = w_i \; HNRA(a) \; ENRA(b)$$

The summation of these nonresponse-adjusted subject base weights over all responding subjects is a nonresponse-adjusted unbiased estimator of the total number of adults in the U.S. population. The corresponding replicate weights are as follows (for each replicate r):

$$SBW_i(r) = w_i(r) \; HNRA(a,r) \; ENRA(b,r)$$

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