Everything You Always Wanted to Know About Trend Analyses and Mode Effects*

* But were afraid to ask

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Overall Goals of the Training

Trend Analysis
• Demonstrate how to do analyses using separate and combined HINTS 2003, 2005 and 2007 data. Use combined data to get means

• Will demonstrate using SUDAAN code

Mode Analysis
• How to test for mode effects

• What mode effects to look for
Aims for Trend Talk

• Demonstrate how separate HINTS 2003, 2005 and 2007 data can be used to:
  – Test for differences in outcomes between survey iterations
    • Across groups or by subgroups
• Demonstrate using a combined HINTS 2003, 2005, 2007 data set to:
  – Test for differences in outcomes between survey iterations
    • Across groups or by subgroups
  – Test for differences in outcomes controlling for covariates
    • Across groups or by subgroups
  – Gain a larger sample size
    • Used to calculate means and variances
    • Most useful for variables not expected to change over time
Overview of Analyses

• Outcome for all analyses: “Have you ever looked for information about cancer from any source?”
  – HC-9 in HINTS 2003
  – CA-08 in HINTS 2005
  – HC-08 in HINTS 2007
  – Will demonstrate using RDD weights from 2007

• Covariates:
  – Agegroup (3 levels)
  – Education (4 levels)
  – Race/Ethnicity (4 levels)
  – Gender
  – Income (4 levels)
  – Hintsyear (3 levels)

• Syntax examples
  – Exclusive use of SAS and SUDAAN
  – Other programs can be used (e.g., STATA, WesVar)
Overview (cont.)

• Techniques here are general
  – Can be used for other HINTS analyses
  – Can be used with other data sets with multiple years

• Assumptions
  – Three independent cross-sectional surveys
  – Same questions, formats, and interpretation
  – Replicate weights for all surveys are available

• References
  – Korn and Graubard (1999) *Analysis of Health Surveys*
HINTS Statistical Weights

• All three HINTS iterations contain full sample and 50 replicate weights.
• Weights derived from:
  – selection probabilities
  – response rates
  – post-stratification adjustment
• HINTS 50 replicate weights obtained by deleting \(\frac{1}{50}\)th of the respondents (and re-weighting)
  – Each replicate is similar to a HINTS yearly sample
  – The variability in replicate estimates can be used to estimate variance
Replicate & Full-sample Weights

• Full-sample weight is the statistical weight described earlier

• Replicate weights only available with certain datasets
  • Obtained by deleting mutually exclusive, exhaustive parts of the sample and weighting these
Example Using HINTS 2003 Weights: Full Sample and Replicate

<table>
<thead>
<tr>
<th>Sub</th>
<th>fwgt</th>
<th>fwgt1</th>
<th>fwgt2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14,367</td>
<td>14,693</td>
<td>14,837</td>
</tr>
<tr>
<td>2</td>
<td>109,694</td>
<td>111,069</td>
<td>111,021</td>
</tr>
<tr>
<td>3</td>
<td>14,767</td>
<td>0</td>
<td>14,859</td>
</tr>
<tr>
<td>4</td>
<td>18,467</td>
<td>19,301</td>
<td>0</td>
</tr>
</tbody>
</table>

Full sample (fwgt) and 2 replicate weights (fwgt1, fwgt2) for 4 sampled people. First two subjects are in both replicates while other two are not. The sum of each column of weights is the same – 209,454,391.
Analyses Using Separate Data Sets
Testing for Change Using Separate Datasets

• Do not need combined data
• Do need the following information:
  - Estimates and variances from each survey year*

<table>
<thead>
<tr>
<th>Year</th>
<th>True value</th>
<th>Estimated value</th>
<th>Variance of estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>$\theta_{2003}$</td>
<td>$\hat{\theta}_{2003}$</td>
<td>$\nu(\hat{\theta}_{2003})$</td>
</tr>
<tr>
<td>2005</td>
<td>$\theta_{2005}$</td>
<td>$\hat{\theta}_{2005}$</td>
<td>$\nu(\hat{\theta}_{2005})$</td>
</tr>
<tr>
<td>2007</td>
<td>$\theta_{2007}$</td>
<td>$\hat{\theta}_{2007}$</td>
<td>$\nu(\hat{\theta}_{2007})$</td>
</tr>
</tbody>
</table>

\[ \Delta = \theta_{200X} - \theta_{200Y} \quad \hat{\Delta} = \hat{\theta}_{200X} - \hat{\theta}_{200Y} \quad \nu(\hat{\Delta}) = \nu(\hat{\theta}_{200X}) + \nu(\hat{\theta}_{200Y}) \]

* From SUDAAN proc descript or proc crosstab or SAS proc survey means.
Analyses Using Combined 2003, 2005 and 2007 Data
## Final Sample and Replicate Weights for Trend/Mode Tests

<table>
<thead>
<tr>
<th></th>
<th>Final Sample Weights</th>
<th>Replicate Weights 1-50</th>
<th>Replicate Weights 51-100</th>
<th>Replicate Weights 101-150</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HINTS 2003</strong></td>
<td>2003 Final Weight (fwgt)</td>
<td>2003 Replicate Weights (fwgt1-fwgt50)</td>
<td>2003 Final Weight (fwgt)</td>
<td>2003 Final Weight (fwgt)</td>
</tr>
<tr>
<td><strong>HINTS 2005</strong></td>
<td>2005 Final Weight (fwgt)</td>
<td>2005 Final Weight (fwgt)</td>
<td>2005 Replicate Weights (fwgt1-fwgt50)</td>
<td>2005 Final Weight (fwgt)</td>
</tr>
<tr>
<td><strong>HINTS 2007</strong></td>
<td>2007 Final Weight (rwgt0)</td>
<td>2007 Final Weight (rwgt0)</td>
<td>2007 Final Weight (rwgt0)</td>
<td>2007 Replicate Weights (rwgt1-rwgt50)</td>
</tr>
<tr>
<td><strong>Combined Data</strong></td>
<td>Final Weight (nfwgt)</td>
<td>Final Replicate Weights (nfwgt1-nfwgt50)</td>
<td>Final Replicate Weights (nfwgt51-nfwgt100)</td>
<td>Final Replicate Weights (nfwgt101-nfwgt150)</td>
</tr>
</tbody>
</table>
SAS Syntax to Create Sample/Replicate Weights for Trend Analyses (2007 Composite)

***Set new weight variables for the combined dataset;
  array origwgts[50] fwgt1-fwgt50;
  array cmbdwgts[50] cwgt1-cwgt50;
  array newwgts[150] nfwgt1-nfwgt150;

do i = 1 to 50;
  if hintsyear=1 then do;***2003;
    nfwgt=fwgt;
    newwgts[i]   = origwgts[i];
    newwgts[i+50] = fwgt;
    newwgts[i+100] = fwgt;
  end;
  else if hintsyear=2 then do;***2005;
    nfwgt=fwgt;
    newwgts[i]   = fwgt;
    newwgts[i+50] = origwgts[i];
    newwgts[i+100] = fwgt;
  end;
  else if hintsyear=3 then do;***2007;
    nfwgt=cwgt0;
    newwgts[i]   = cwgt0;
    newwgts[i+50] = cwgt0;
    newwgts[i+100] = cmbdwgts[i];
  end;
end;

drop fwgt--fwgt50 i;
label nfwgt="Final full-sample weight";
attrib nfwgt1-nfwgt150 label="Final sample replicate weights";
SAS Syntax to Create Sample/Replicate Weights for Trend Analyses (2007 RDD)

***Set new weight variables for the combined dataset;
array origwgts[50] fwgt1-fwgt50;
array catiwgts[50] rwgt1-rwgt50;
array newwgts[150] nfwgt1-nfwgt150;

do i = 1 to 50;
    if hintsyear=1 then do;***2003;
        nfwgt=fwgt;
        newwgts[i] = origwgts[i];
        newwgts[i+50] = fwgt;
        newwgts[i+100] = fwgt;
    end;
    else if hintsyear=2 then do;***2005;
        nfwgt=fwgt;
        newwgts[i] = fwgt;
        newwgts[i+50] = origwgts[i];
        newwgts[i+100] = fwgt;
    end;
    else if hintsyear=3 then do;***2007;
        nfwgt=rwgt0;
        newwgts[i] = rwgt0;
        newwgts[i+50] = rwgt0;
        newwgts[i+100] = catiwgts[i];
    end;
end;

label nfwgt="Final full-sample weight";
attrib nfwgt1-nfwgt150 label="Final sample replicate weights";
Design Statements for Combined Data

```
proc procedurename data=combined design=jackknife;
weight nfwgt;
jackwgt nfwgt1-nfwgt150 /adjjack=.98;
```

Notes:
1) nfwgt= Final sample weight for estimated US point estimates
2) nfwgt1 to nfwgt150= Replicate weights for variance estimates
T-Tests and Linear and Quadratic Tests Using a Combined Dataset

***T Tests and Tests of Linear and Quadratic Trends;
proc descript data=hints design=jackknife;
weight nfwgt;
jackwgts nfwgt1-nfwgt150 / adjjack=0.98;
var seekCancer;
class hintsYear / noreFields;

contrast hintsYear=(1 -1 0) / name="Test of 2003 vs 2005";
contrast hintsYear=(1 0 -1) / name="Test of 2003 vs 2007";
contrast hintsYear=(0 1 -1) / name="Test of 2005 vs 2007";
contrast hintsYear=(1 0 -1) / name="Survey Year Contrast (Linear)";
contrast hintsYear=(1 -2 1) / name="Survey Year Contrast (Quadratic)";
polynomial hintsYear=2 / name="Survey Year Contrast (Linear & Quadratic)";

print nsum mean semean upmean="95% UCI Mean" lowmean="95% LCI Mean"
t_mean p_mean;
run;

Note: Outcome variable is coded 0/1
“Have you ever looked for cancer information from any source?”

<table>
<thead>
<tr>
<th>Year</th>
<th>% Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>44.9%</td>
</tr>
<tr>
<td>2005</td>
<td>48.7%</td>
</tr>
<tr>
<td>2007</td>
<td>39.4%</td>
</tr>
</tbody>
</table>

Note: All pairwise and polynomial trends are statistically significant (alpha=.05); Used RDD weights in 2007.
Estimating Change While Controlling for Covariates With Combined Data

• Can only be done with combined data
• Across all subjects
• By demographic subgroup
  – Demonstrate using education
• Use a regression approach:
  – Multiple regression for continuous outcomes
  – Logistic regression for dichotomous outcomes
• Created HINTSYEAR variable to code for survey iteration
• Used recoded/reformatted demographic variables as covariates
Testing for Changes Across Years Controlling for Covariates-Syntax

***SUDAAN - Accounting for demographic variables, test difference in cancer seeking between survey years;
***SUDAAN - Test for linear and quadratic trends of cancer seeking and survey year;

```sas
proc rlogist data=hints design=jackknife;
weight nfwgt;
jackwgts nfwgt1-nfwgt150 / adjjack=0.98;

class hintsYear spgender ageGroup educA race income / nofreq;
model seekCancer = hintsYear spgender ageGroup educA race income;
reflevel hintsYear=1 spgender=1 ageGroup=1 educA=1 race=1 income=1;

effects hintsYear = (1 -1 0) / name="SURVEY-YEAR 2003 VS 2005";
effects hintsYear = (1 0 -1) / name="SURVEY-YEAR 2003 VS 2007";
effects hintsYear = (0 1 -1) / name="SURVEY-YEAR 2005 VS. 2007";
effects hintsYear = (1 0 -1) / name="LINEAR TREND SURVEY-YEAR";
effects hintsYear = (1 -2 1) / name="QUADRATIC TREND SURVEY-YEAR";

run;
```

Note: Outcome variable is a dummy coded (0,1);
Testing for Changes by Demographic Subgroup
Controlling for Covariates

Test for differences across levels of education. Start with lowest level (Less Than High School) controlling for age, gender, race and income (note SUBPOPN statement)

```
proc rlogist data=hints design=jackknife ;
weight nfwgt;
jackwgts nfwgt1-nfwgt150 / adjjack=0.98;
subpopn educA=1 / name="Education Level: Less than High School";
class hintsYear spgender ageGroup race income /nofreq;
model seekCancer = hintsYear spgender ageGroup race income;
reflevel hintsYear=1 spgender=1 ageGroup=1 race=1 income=1;

effects hintsYear = (1 -1 0) / name="SURVEY-YEAR 2003 VS 2005";
effects hintsYear = (1 0 -1) / name="SURVEY-YEAR 2003 VS 2007";
effects hintsYear = (0 1 -1) / name="SURVEY-YEAR 2005 VS 2007";
effects hintsYear = (1 0 -1) / name="LINEAR TREND SURVEY-YEAR";
effects hintsYear = (1 -2 1) / name="QUADRATIC TREND";
run;
```

Note: Can also test three other levels of education substituting remaining values in the SUBPOPN statement;
Testing for Changes by Levels of Education: Results

<table>
<thead>
<tr>
<th></th>
<th>Odds Ratio</th>
<th>Lower Bound 95% CI</th>
<th>Upper Bound 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Less Than High School</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2005</td>
<td>0.82</td>
<td>0.56</td>
<td>1.20</td>
</tr>
<tr>
<td>2007</td>
<td>0.64</td>
<td>0.40</td>
<td>1.01</td>
</tr>
<tr>
<td><strong>High School Graduate</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2005</td>
<td>1.28</td>
<td>1.05</td>
<td>1.56</td>
</tr>
<tr>
<td>2007</td>
<td>0.80</td>
<td>0.65</td>
<td>0.99</td>
</tr>
<tr>
<td><strong>Some College</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2005</td>
<td>1.28</td>
<td>1.01</td>
<td>1.62</td>
</tr>
<tr>
<td>2007</td>
<td>0.72</td>
<td>0.59</td>
<td>0.89</td>
</tr>
<tr>
<td><strong>College Graduate or More</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>2005</td>
<td>1.07</td>
<td>0.87</td>
<td>1.31</td>
</tr>
<tr>
<td>2007</td>
<td>0.77</td>
<td>0.63</td>
<td>0.95</td>
</tr>
</tbody>
</table>
Adjusted Marginal Percentages (Means)

Note: Used linear regression and least-square means to get values; RDD weights in 2007
Estimating Weighted Mean Using Data Combined Across 2003, 05, 07

• Can be used to create larger sample size
• Best used for variables not expected to change over time
• Can be assessed across respondents and by subgroups
• Will calculate weighted mean across combined data
  – Weights each year proportional to its estimated population
Calculate Mean % of Respondents Using Combined Data

```sas
proc descript data=hints design=jackknife;
weight nfwgt;
jackwgts nfwgt1-nfwgt150 / adjjack=0.98;
var seekCancer;
catlevel 1;
print nsum percent lowpct uppct/style=nchs;
run;

Note:
1) Will give sample size, mean %, lower and upper 95% CI;
2) Will get accurate weighted mean;
3) Sample size will be 3x population;
```
Calculate Mean % of Respondents by Subgroups

```sas
proc descript data=combined design=jackknife;
  weight nfwgt;
  jackwgts nfwgt1-nfwgt150 /adjjack=.98;
  class hintsyear seekcancer spgender ageGroup race income /nofreq;
  var seekcancer;
  catlevel 1;
  tables (spgender ageGroup race income);
  print nsum percent lowpct uppct/style=nchs;
run;
```

Note: Will give sample size, mean %, lower and upper 95% CI;
# Means From Combined Data

<table>
<thead>
<tr>
<th>Variables</th>
<th>Weighted Mean</th>
<th>LL 95% CI</th>
<th>UL 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>44.27</td>
<td>43.35</td>
<td>45.20</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-34</td>
<td>38.38</td>
<td>36.10</td>
<td>40.72</td>
</tr>
<tr>
<td>35-64</td>
<td>49.86</td>
<td>48.59</td>
<td>51.13</td>
</tr>
<tr>
<td>65+</td>
<td>36.95</td>
<td>35.19</td>
<td>38.75</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NH White</td>
<td>49.38</td>
<td>48.23</td>
<td>50.54</td>
</tr>
<tr>
<td>NH Black</td>
<td>40.41</td>
<td>36.67</td>
<td>44.27</td>
</tr>
<tr>
<td>Hispanic</td>
<td>24.20</td>
<td>21.61</td>
<td>26.99</td>
</tr>
<tr>
<td>NH Other</td>
<td>45.38</td>
<td>39.25</td>
<td>51.64</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>37.32</td>
<td>35.77</td>
<td>38.90</td>
</tr>
<tr>
<td>Female</td>
<td>50.76</td>
<td>49.48</td>
<td>52.04</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; $20k</td>
<td>33.01</td>
<td>30.62</td>
<td>35.49</td>
</tr>
<tr>
<td>$20k - &lt;$50k</td>
<td>42.56</td>
<td>40.75</td>
<td>44.40</td>
</tr>
<tr>
<td>$50k+</td>
<td>53.45</td>
<td>51.71</td>
<td>55.17</td>
</tr>
</tbody>
</table>
Summary

• Creating the combined data set is hardest part, but gives more versatility than using separate data sets
  – Do not use combined data to get single-year estimates unless you adjust denominator df

• If using combined data, make sure variable names, formats, and interpretations are equivalent across years

• With three data points can test for linear and quadratic trends

• Once you have combined data, analyses are similar to those done with a single data set
Mode Discussion

• Why was a Dual Frame-Dual Mode design used?

• Deciding on which mode (frame) you use

• What weights should be used when conducting different types of analyzes
HINTS 2007: Dual Frame – Dual Mode Survey

• Dual frames:
  – Random Digit Dial RDD
  – Address sample: Residential address used by the USPS to deliver mail

• Dual Mode:
  – RDD was administered by telephone
  – Address was administered by mail.
    • Small number of Hispanics call in for Spanish interview
Why a Dual Frame, Dual Mode Design (DFDM)?

• Continued decline in quality of the RDD frame
  – Response rate continues to decline (HINTS 2003 vs 2005)
  – Increasing number of persons without landline telephones
  – Cost of RDD is increasing because of the two above points
    • More calls and special procedures have to be used to get response
    • Have to add in a cell phone frame ---- not clear how this works. It is also more expensive to use this methodology.

• DFDM allows for continuing the trend from previous and future HINTS data collection
  – Some anticipation that future HINTs surveys will move away from RDD-telephone survey
Methodological Advantage

• There are many studies that are multi-mode, but cannot assess effects (e.g., NHIS; CPS; NCVS)
• DFSM allows testing for robustness of results by measurement method
• Can use the advantages of each mode for different analytic issues
Disadvantage of Design

• Introduces some decisions that have to be made on which mode or modes should be used in analysis

• Concentrating on a single mode reduces sample size
Steps for Analysis

1. Trend analysis or Focus on Hispanics?
2. Compare estimates for the Address frame and the RDD frame
3. If there is not a difference, then use composite weights
4. If there is a difference, then:
   1. Select a mode, and/or
   2. Conduct analysis both ways
Step 1: Trend analysis?

• Use the telephone sample - This keeps the mode of interview consistent with HINTS 2003 and 2005

• If there is a need to increase the sample size, test for differences between the RDD and the address sample
  – If there are no differences, consider using the combined sample
Step 1 (cont): Focus on Hispanics?

• If Hispanics are a focus of analysis, then use the RDD sample

• Spanish speaking Hispanics are under-represented in the mail survey
  – Could be correlated with important outcomes
Step 2: Compare Estimates

- **Descriptive analyses:**
  - Compare frequencies and crosstabs between frames

- **Relationships:**
  - Run crosstabulations by frame-type
  - Run models separately by frame type or using frame type as a covariate
Weights Available on File

• Three types of weights
  – Address sample only (MWGT0)
  – RDD sample only (RWGT0)
  – Composite weight (CWGT0)

• For mode comparisons, use the frame specific weights (mwgto; rwgto)
Weights adjust for non-response and coverage

• Weights include adjustments for demographics, ever having cancer and health insurance status

• Each set of weights sums to national totals

• Weights do not fully compensate for
  – Under-representation of Hispanics on mail survey. Spanish speaking Hispanics may be different from those that filled out English questionnaire. Requires more analysis
  – Lack of coverage of cell-only on telephone. Cell-only individuals are different from those with a landline, even after controlling for demographic characteristics (Han and Cantor, 2008)
Example:

% Buying Medicine Online

<table>
<thead>
<tr>
<th></th>
<th>Address frame</th>
<th>RDD frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimate</td>
<td>12.7</td>
<td>15.3</td>
</tr>
<tr>
<td>Standard Error</td>
<td>.9</td>
<td>.9</td>
</tr>
</tbody>
</table>

Z test: \((P_1 - P_2)/\sqrt{V(P_1) + V(P_2)} = (12.7 - 15.3)/\sqrt{.9^2 + .9^2}\)

= 2.04
Weights to Test Significance within Statistical Program

<table>
<thead>
<tr>
<th></th>
<th>Final Sample Weights</th>
<th>Replicate Weights 1-50</th>
<th>Replicate Weights 51-100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address sample</td>
<td>Address sample final weight (MWGT0)</td>
<td>Address replicate Weights (MWGT1 – MWGT50)</td>
<td>Address sample final weight (MWGT0)</td>
</tr>
<tr>
<td>RDD sample</td>
<td>RDD sample final Weight (rwgt0)</td>
<td>RDD Final Weight (rwgt0)</td>
<td>RDD sample Replicate weights (rwgt1-rwgt50)</td>
</tr>
<tr>
<td>Combined Data</td>
<td>Final Weight (nfwgt)</td>
<td>Final Replicate Weights (nfwgt1-nfwgt50)</td>
<td>Final Replicate Weights (nfwgt51-nfwgt100)</td>
</tr>
</tbody>
</table>
***Set new weight variables for the combined dataset;
array origwgts[50] mwgt1-mwgt50;
array catiwgts[50] rwgt1-rwgt50;
array newwgts[100] nfwgt1-nfwgt100;
do i = 1 to 50;
   if sampflag=1 then do;***address;
      nfwgt=mwgt0;
      newwgts[i] = origwgts[i];
      newwgts[i+50] = mwgt0;
   end;
   else if sampflag=2 then do;***RDD;
      nfwgt=rwgt0;
      newwgts[i+50] = catiwgts[i];
      newwgts[i] = rwgt0;
   end;
label nfwgt="Final full-sample weight";
attrib nfwgt1-nfwgt100 label="Final sample replicate weights";
Have you ever looked for information about cancer from any source?

<table>
<thead>
<tr>
<th></th>
<th>Address frame</th>
<th>RDD frame</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Estimate</strong></td>
<td>39.8</td>
<td>38.1</td>
</tr>
<tr>
<td><strong>Standard Error</strong></td>
<td>1.0</td>
<td>.8</td>
</tr>
</tbody>
</table>
T-Test for Differences in Proportions Using a Combined Dataset

***T Tests to test between modes ***;
proc descrip data=hints design=jackknife;
weight nfwgt;
jackwgts nfwgt1-nfwgt100 / adjjack=0.98;
var seekCancer;
Class sampflag / nofreq;

Contrast sampflag=(1 -1) / name="Test of mail and telephone"

print nsum mean semean upmean="95% UCI Mean" lowmean="95% LCI Mean"
t_mean p_mean;
run;

Note: Outcome variable is coded 0/1
Step 3: If not significant, use the composite estimate

Have you ever looked for information about cancer from any source?

<table>
<thead>
<tr>
<th></th>
<th>Address frame</th>
<th>RDD frame</th>
<th>Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimate</td>
<td>39.8</td>
<td>38.1</td>
<td>39.5</td>
</tr>
<tr>
<td>Standard Error</td>
<td>1.0</td>
<td>.8</td>
<td>.6</td>
</tr>
</tbody>
</table>
Step 3: If not significant, use the composite estimate

Have you ever looked for information about cancer from any source?

<table>
<thead>
<tr>
<th></th>
<th>Address frame</th>
<th>RDD frame</th>
<th>Composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimate</td>
<td>39.8</td>
<td>38.1</td>
<td>39.5</td>
</tr>
<tr>
<td>Standard Error</td>
<td>1.0</td>
<td>.8</td>
<td>.6</td>
</tr>
</tbody>
</table>
What if the difference is statistically significant?

• Is the difference substantively meaningful
  – Many differences will be statistically significant, but not very meaningful
  – If appropriate, consider collapsing categories
How much would you trust information about health or medical topics from the Internet?

<table>
<thead>
<tr>
<th></th>
<th>Address</th>
<th>RDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>A lot</td>
<td>19.4</td>
<td>20.1</td>
</tr>
<tr>
<td>Some</td>
<td>53.2</td>
<td>47.4</td>
</tr>
<tr>
<td>A Little</td>
<td>18.7</td>
<td>18.1</td>
</tr>
<tr>
<td>Not at all</td>
<td>8.6</td>
<td>14.4</td>
</tr>
</tbody>
</table>

P < .000
How much would you trust information about health or medical topics from Family or Friends?

<table>
<thead>
<tr>
<th></th>
<th>Address</th>
<th>RDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>A lot</td>
<td>9.3</td>
<td>22.0</td>
</tr>
<tr>
<td>Some</td>
<td>50.1</td>
<td>43.9</td>
</tr>
<tr>
<td>A Little</td>
<td>35.8</td>
<td>27.4</td>
</tr>
<tr>
<td>Not at all</td>
<td>4.7</td>
<td>6.7</td>
</tr>
</tbody>
</table>

P < .000
Analyzing relationships

• Examine the differences in estimates for the main outcome and analytic variables
• If there are differences, run analysis using the sample that is appropriate for the measures
• To use entire sample:
  – Run the analysis with each sample, and/or
  – Run analysis and include address type as an interaction term
How much would you trust information about health or medical topics from the Internet?

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Address</th>
<th>RDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>3.170**</td>
<td>3.180**</td>
</tr>
<tr>
<td>Age</td>
<td>-0.010**</td>
<td>-0.010**</td>
</tr>
<tr>
<td>Gender (male = 1)</td>
<td>-.170**</td>
<td>-.140**</td>
</tr>
<tr>
<td>Race (white = 1)</td>
<td>.040</td>
<td>.180*</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-.100</td>
<td>-.160</td>
</tr>
<tr>
<td>Serious Mental Illness</td>
<td>-.160</td>
<td>-.350*</td>
</tr>
</tbody>
</table>

* = p<.05; ** = p<.01
How much would you trust information about health or medical topics from family or friends?

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Address</th>
<th>RDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>2.860**</td>
<td>3.040**</td>
</tr>
<tr>
<td>Age</td>
<td>-.003**</td>
<td>-.003**</td>
</tr>
<tr>
<td>Gender (male = 1)</td>
<td>-.140**</td>
<td>.000</td>
</tr>
<tr>
<td>Race (white = 1)</td>
<td>.030</td>
<td>.000</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-.140</td>
<td>-.130</td>
</tr>
<tr>
<td>Serious Mental Illness</td>
<td>-.190*</td>
<td>-.050</td>
</tr>
</tbody>
</table>

* = p<.05;  ** = p<.01
Mode Differences on HINTS

• HINTs has a variety of question types that differ with respect to effects of mode
  – Open vs closed
  – Sensitive items
  – Ordinal scales
  – Knowledge questions

• Selecting a particular mode will depend on the types of measurement differences that apply for particular items
## Measurement advantages of each mode

<table>
<thead>
<tr>
<th>Mail Survey</th>
<th>Telephone Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Fewer social desirability effects</td>
<td>• Less missing data</td>
</tr>
<tr>
<td>• Reduced context and order effects</td>
<td>• Interviewer can answer questions (complicated</td>
</tr>
<tr>
<td>• Aided recall and/or reporting (cues)</td>
<td>definitions)</td>
</tr>
<tr>
<td>• Fewer primacy/recency effects</td>
<td>• Unaided recall and/or reporting</td>
</tr>
</tbody>
</table>
Open-ended with a list of responses

**Section A**
**Seeking Information about Health**

A1. Have you ever looked for information about health or medical topics from any source?
- [ ] Yes
- [x] No → **Go to Question A6**

A2. The most recent time you looked for information about health or medical topics, where did you go first?

- [ ] Books
- [ ] Magazines
- [ ] Brochures, pamphlets, etc.
- [ ] Newspapers
- [ ] Cancer organization
- [ ] Telephone information number
- [ ] Family
- [ ] Complementary, alternative, or unconventional practitioner
- [ ] Friend/co-worker
- [ ] Other → **Please specify below:**
- [ ] Doctor or health care provider
- [ ] Internet
- [ ] Library
Results for HC-01

• Significant difference between modes:
  – Mail questionnaire: 77%
  – Telephone: 61%

• Mail respondents can see follow-up question:
  – This defines the targeted behavior
  – List serves as memory cues (aided recall)

• Recommend using the mail survey because the estimates are based on better understanding of the question
Open ended asking for dates

I5. When do you expect to have your next Pap test?  
BR59WhenNextPapTest 0686  
Mark only one.

☐ A year or less from now
☐ More than 1 but not more than 3 years from now
☐ More than 3 but not more than 5 years from now
☐ Over 5 years from now
☐ Am not planning to have another
☐ If I have symptoms
☐ When doctor/health care provider recommends
☐ I am not planning to have another because I got or am planning to get the HPV vaccine
☐ I am not planning to have another because I got or am planning to get the HPV test instead
Items provide aided recall for mail survey respondents

• Other items similar to this: are BR-76; BR-88; BR91; BR-94

• Seeing categories aids mail survey respondent in the recall task:
  – Defines dating accuracy
  – Cues respondent with non-time related categories

• If can’t combine, use mail because of aided recall
When do you expect to get your next pap test?

<table>
<thead>
<tr>
<th>BR-59</th>
<th>Phone</th>
<th>Mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>A year or less</td>
<td>78%</td>
<td>71%</td>
</tr>
<tr>
<td>1 to 3 years</td>
<td>4%</td>
<td>10%</td>
</tr>
<tr>
<td>3 to 5 years</td>
<td>--</td>
<td>2%</td>
</tr>
<tr>
<td>Not planning to</td>
<td>10%</td>
<td>6%</td>
</tr>
<tr>
<td>If symptomatic</td>
<td>--</td>
<td>2%</td>
</tr>
<tr>
<td>When Doctor recommends</td>
<td>2%</td>
<td>8%</td>
</tr>
<tr>
<td>Planning HPV test instead</td>
<td>--</td>
<td>1%</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>5%</td>
<td>--</td>
</tr>
</tbody>
</table>
Ordinal Scales: Mail vs Telephone

• Prior research has found telephone interviews are more likely to respond on the extremes (Tarnai and Dillman, 1992; De Leeuw, 2005; Dillman et al, 2008)
  – More “satisficing” on the telephone
  – On telephone, Rs tend to respond on extreme points
  – Not a consistent effect

• In many cases, the effect is not large

• Use composite or mail survey, depending on importance of mode differences
Examples of ordinal scales

- **Likert**
  - Strongly agree
  - Somewhat agree
  - Somewhat disagree
  - Strongly disagree

- **Evaluation scale**
  - Excellent
  - Very good
  - Good
  - Fair
  - Poor

- **Frequency**
  - Always
  - Usually
  - Sometimes
  - Never
  - A lot
  - Some
  - A little
  - Not at all
During the past 12 months, how often did doctors, nurses, or other health professionals give you the chance to ask all the health-related questions you had?

Would you say...

<table>
<thead>
<tr>
<th>HS-07a</th>
<th>Phone</th>
<th>Mail</th>
<th>Comp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>58%</td>
<td>56%</td>
<td>57%</td>
</tr>
<tr>
<td>Usually</td>
<td>25%</td>
<td>32%</td>
<td>28%</td>
</tr>
<tr>
<td>Sometimes</td>
<td>14%</td>
<td>11%</td>
<td>12%</td>
</tr>
<tr>
<td>Never</td>
<td>4%</td>
<td>1.5%</td>
<td>3%</td>
</tr>
</tbody>
</table>
Social Desirability

- Self-Administered questionnaires are less subject to social desirability
- Respondents will report higher incidence of behaviors and/or attitudes that are not socially acceptable
- For behaviors that are sensitive or socially undesirable, use the mail survey
During the past 30 days, how often did you feel worthless?

<table>
<thead>
<tr>
<th>HD03Worthless</th>
<th>Phone</th>
<th>Mail</th>
<th>Comp</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of the time</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Most of the time</td>
<td>2%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Some of the time</td>
<td>7%</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>A little of the time</td>
<td>9%</td>
<td>14%</td>
<td>12%</td>
</tr>
<tr>
<td>None of the time</td>
<td>81%</td>
<td>72%</td>
<td>75%</td>
</tr>
</tbody>
</table>
During the past 30 days, how often did you feel worthless?

<table>
<thead>
<tr>
<th>HD03Worthless</th>
<th>Phone</th>
<th>Mail</th>
<th>Comp</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of the time</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Most of the time</td>
<td>2%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Some of the time</td>
<td>7%</td>
<td>9%</td>
<td>8%</td>
</tr>
<tr>
<td>A little of the time</td>
<td>9%</td>
<td>14%</td>
<td>12%</td>
</tr>
<tr>
<td>None of the time</td>
<td>81%</td>
<td>72%</td>
<td>75%</td>
</tr>
</tbody>
</table>
Knowledge Questions and “Don’t Know”

• There are a number of items that ask respondents what are recommended health procedures
  – Exercise (BR-07); sunlight and vitamin D (BR-16); cigarette products (BR-40; BR-45); HPV (BR-67, 68, 70), effectiveness of different colon cancer tests (BR-96).
  – Telephone has significantly more “Don’t Know” than mail
  – Taking out the DK group, the distributions between mail and telephone get much closer.

• Mail survey did not include a DK category

• If “Don’t Know” is important to analyze, then you should use the telephone.
How many servings of fruits and vegetables do you think the average adult should eat each day for good health?

<table>
<thead>
<tr>
<th></th>
<th>With DK*</th>
<th></th>
<th>Without DK</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Phone</td>
<td>Mail</td>
<td>Phone</td>
</tr>
<tr>
<td>BR-03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 – 2 servings</td>
<td>21%</td>
<td>25%</td>
<td>24%</td>
</tr>
<tr>
<td>3 – 4 servings</td>
<td>34%</td>
<td>42%</td>
<td>39%</td>
</tr>
<tr>
<td>5 – 6 servings</td>
<td>24%</td>
<td>26%</td>
<td>27%</td>
</tr>
<tr>
<td>7 or more servings</td>
<td>9%</td>
<td>7%</td>
<td>10%</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>13%</td>
<td>--</td>
<td>na</td>
</tr>
</tbody>
</table>

*DK – Don’t Know; -- < .5%; Na – not applicable
Examples of other question types

• Items with “mark all that apply” (sources of cancer information; where heard about HPV)
  – Mail survey respondents report more than telephone respondents

• Items requiring technical definitions (colon cancer tests)
  – Interviewer is able to supply definitions and reinforce the definition during the interview
Thank-you

moserr@mail.nih.gov

davidcantor@westat.com