The National Health Interview Survey (NHIS): An Overview of Survey Design, Data Access, and Applications to Public Health

Michael E. Martinez, MPH, MHSA
Adena M. Galinsky, PhD
Tainya C. Clarke, PhD, MPH

Division of Health Interview Statistics
National Center for Health Statistics
Objectives

- Describe how the NHIS is conducted
- Describe how to access NHIS data
- Describe NHIS sample design and weighting
- Provide an example of creating NHIS data files
- Provide examples of its use in health monitoring
- Discuss future directions and resources for learning
What is the National Health Interview Survey (NHIS)?
The National Health Interview Survey (NHIS)

- Established by the 1956 National Health Survey Act, Public Law 652, 84th Congress
- Authorized as the National Health Survey
- First fielded in July, 1957
NHIS General Purposes

- Collect data on the health status and health care access of the U.S. non-institutionalized population
- Address specific issues of current public health concern
- Provide estimates for monitoring (Health United States, Healthy People program)
  - 69 Healthy People 2020 Objectives
NHIS Interview Protocol

- In-person household interview survey
  - With some telephone follow-up
- Interviews performed by trained U. S. Census Bureau interviewers
- Computer-assisted personal interviewing
NHIS Interview Protocol (cont.)

- Household respondent provides basic socio-demographic information on all members of household

- For each family within a household
  
  - A knowledgeable adult 18 or older responds for him/herself and all other family members (Family Respondent)
  
  - One adult 18 or older (*Sample Adult*) and one child under age 18 (*Sample Child*) are randomly selected for more extensive set of questions. The sample adult answers for his/her self, while a knowledgeable adult answers for the child.
NHIS Structure: Basic Module

**Family Core**
- General information on all family members
- Family data
- Allows proxy respondents
- Fielded each year

**Sample Adult Core**
- Self-response only
- Fielded each year

**Sample Child Core**
- Knowledgeable adult responds for child
- Fielded each year

Demographic and general health data
Health condition, risk behavior, and health behavior data
NHIS Structure (cont.): Supplemental Modules

**Purpose**
- New topics or more detail on core topics
- Different each year
- Meet department goals/objectives

**Sponsors of supplements (examples):**
- National Cancer Institute (NCI)
- United States Department of Agriculture (USDA)
- Office of the Assistant Secretary for Planning and Evaluation (ASPE)
- National Center for Environmental Health (NCEH)
Examples of NHIS Supplements

- Diabetes (2003, 2007)
- Disability (2002, 2008-present)
- Epilepsy (2010, 2013)
- Food Security (2011-present)
- Health Information Technology (2009, 2011-present)
- Health Insurance (2011-present)
- Immunization (2008-present)
- Medical Care Access and Utilization (2011-present)
- Oral Health (2008)
NHIS Core Content

- Health conditions
- Health care access and utilization
- Health behaviors and risk factors
- Sociodemographic characteristics
Accessing NHIS Data
Where to Access NHIS Data?

http://www.cdc.gov/nchs/nhis.htm
Where to Access NHIS Data?

http://www.cdc.gov/nchs/nhis.htm
Questionnaires, Datasets and Related Documentation, 1997-Present

- Survey Description Document
- Survey Questionnaires
  - Questionnaire Reference Guide
  - English (Questionnaires and Flashcards)
  - Spanish (Questionnaire and Flashcards)
  - Field Representative Manual and Survey Flowchart

- Information on Co-Sponsors and Supplements
- Reports
- Data Release
For each data file:

- Variable summary
- Variable layout
- Variable frequencies
- ASCII data
- Sample SAS statements
- Sample SPSS statements
- Sample Stata statements
2014 NHIS Data Release

- Documentation for each data file
  - Variable summary
  - Variable layout
  - Variable frequencies
  - ASCII data
  - Sample SAS statements
  - Sample SPSS statements
  - Sample Stata statements
Sample Adult file

- Variable summary [PDF - 372 KB]
- Variable layout [PDF - 2.3 MB]
- Variable frequencies [PDF - 493 KB]
- ASCII data [ZIP - 4 MB]

Sample SAS statements [SAS - 142 KB]
Sample SPSS statements [SPS - 192 KB]
Sample Stata statements [DO - 128 KB]
2014 NHIS Data Release

Data files released for 2014:

- Family (FAMILYXX)
- Household (HOUSEHLD)
- Injury/Poisoning Episode (INJPOIEP)
- Person (PERSONSX)
- Sample Child (SAMCHILD)
- Sample Adult (SAMADULT)

- Imputed Income Files (INCMIMP1-INCMIMP5)
- Paradata (PARADATA)
- Family Disability Questions Tests (FMLYDISB)
- Functioning and Disability (FUNCDISB)

(File names shown in parentheses)
Creating an NHIS Data File: Some Considerations
NHIS Sample Design

- Complex
- Important to take into account when computing variance estimates

For more information, see Design and Estimation for the National Health Interview Survey, 2006-2015: http://www.cdc.gov/nchs/data/series/sr_02/sr02_165.pdf
Sampling Weights

- Each file has its own sampling weight
- Weights should be used for all analyses
- Weights are used to inflate each observation
- Weights are adjusted for non-response, over-sampling, and most are calibrated to U.S. Census population estimates by age, sex, and race/ethnicity
- If weights are not used:
  - Percentages, means, and proportions will be affected
  - Estimates such as regression coefficients may be biased
Weighting Example: Race/Ethnicity of Persons 18-64 Years, NHIS 2013

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Unweighted (%)</th>
<th>Weighted (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hispanic</td>
<td>21.8</td>
<td>16.5</td>
</tr>
<tr>
<td>NH white</td>
<td>54.9</td>
<td>64.4</td>
</tr>
<tr>
<td>NH black</td>
<td>14.7</td>
<td>12.6</td>
</tr>
<tr>
<td>NH Asian</td>
<td>7.3</td>
<td>5.6</td>
</tr>
<tr>
<td>NH all other races</td>
<td>1.3</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Note: NH = non-Hispanic.
Sample Design Variables

- Consequences of not accounting for sample design when calculating variance
  - Standard errors will be, on average, too small and confidence intervals too narrow
  - More Type I error

- To obtain accurate variance estimates, use the NHIS design variables in your analysis to account for the NHIS complex sample design
Using Weights and Sample Design Variables, Example: Average Number of Days in Bed Due to Illness/Injury for NH White and NH Black Adults 18-64 Years, NHIS 2012

<table>
<thead>
<tr>
<th>Statistic</th>
<th>NHIS Unweighted</th>
<th>NHIS Weighted</th>
<th>NHIS Complex Weighted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NHW</td>
<td>NHB</td>
<td>NHW</td>
</tr>
<tr>
<td>Mean</td>
<td>4.41</td>
<td>5.59</td>
<td>4.10</td>
</tr>
<tr>
<td>Std. error</td>
<td>0.18</td>
<td>0.41</td>
<td>0.18</td>
</tr>
<tr>
<td>t-statistic</td>
<td>-2.88</td>
<td></td>
<td>-1.99</td>
</tr>
<tr>
<td>p-value</td>
<td>0.004</td>
<td></td>
<td>0.046</td>
</tr>
</tbody>
</table>

Note: NHW = non-Hispanic white; NHB = non-Hispanic black.
Variables to Include in Your Analytic File

1. Study variables

2. Weight variable(s)

3. Sample design variables
   - STRAT_P and PSU_P (2006-Present)
   - STRATUM and PSU (1997-2005)
Which Weight Do I Use?

- Person file: ............... **WTFA**
- Sample Adult file: ...... **WTFA_SA**
- Sample Child file: ...... **WTFA_SC**
- Household file:.......... **WTFA_HH**
- Family file:............. **WTFA_FAM**
Creating the File: Example Research Question

Is there a relationship between the health insurance status of adults and unmet medical needs due to cost?
Creating the File: Data File Information Available

- Survey Description Document
- File documentation (i.e., layout, summary, unweighted frequencies)
- Data
- SAS, SPSS, and Stata input statements
- Questionnaire (English and Spanish)
- Interviewer’s Manual
Creating the File: Creating a Formatted File from Raw Data

- The NHIS data and SAS, SPSS, and Stata programs are available from the NHIS website (http://www.cdc.gov/nchs/nhis.htm).

- Programs can be used to create datasets with variable formats and labels.

- Each data file (e.g., Person, Sample Adult) has its own SAS, SPSS, and Stata program.
Creating the File: Identifying the Files You Need

- Variables are in different files
  - Health insurance (Person file)
  - Unmet medical needs (Sample Adult files)
- Must merge Person and Sample Adult files
Creating the File: Identifying the Files/Variables You Need

- Person file variables:
  - Identifiers: household number (HHX), family number (FMX), and person number (FPX)
  - Health insurance (NOTCOV)
  - Design variables (STRAT_P and PSU_P)
Creating the File: Identifying the Files/Variables You Need

- Sample Adult file variables
  - Identifiers: household number (HHX), family number (FMX), and person number (FPX)
  - Needed, but could not afford and did not receive any of the following in the past 12 months:
    - Prescription medications (AHCAFYR1)
    - Mental health care or counseling (AHCAFYR2)
    - Dental care (including check-ups) (AHCAFYR3)
    - Eyeglasses (AHCAFYR4)

- Sample Adult sampling weight (WTFA_SA)
Creating the File: Identifying the Files/Variables You Need

- Weight chosen depends on the unit of analysis
  - The population of interest
  - In what data file the main outcome of interest is located
Creating the File: Merging Files Together

- To merge the Person and Sample Adult files, use the household number (HHX), family number (FMX), and person number (FPX)

- Note the name of the person number variable has changed:
  - FPX (2004-Present)

- Example merging code can be found in...

  The Survey Description Document
Creating the File: Merging Files Together

Sample Adult File + Person File = Adults who are not Sample Adults, and all children Sample Adults
Creating the File: Merging Files Together

Sample Adult File + Person File =

Adults who are not Sample Adults, and all children Sample Adults

DROP? NO!
Creating the File: Subpopulation Analysis

- Can produce correct point estimates using appropriately weighted subsetted data. But...

- **Must retain design variable information for all records to obtain correct variance estimates**

- To obtain estimates for a subpopulation, use the appropriate statistical software procedures:
  - **SUBPOP** (Stata)
  - **SUBPOPN** (SUDAAN)
  - **DOMAIN** (SAS)
Creating the File: Subpopulation Analysis

- For more specific information, see

The Survey Description Document

Creating the File: Summary

- The NHIS data are released as multiple data files that can be merged together.
- Use the documentation to identify which files have the variables you need.
- Be sure to get the design variables and weight variable from the appropriate files.
- Use appropriate statistical software to use the weights and the sample design variables to obtain accurate, unbiased point estimates and variance estimates.
Examples using the NHIS
Racial and Ethnic Disparities in Men's Use of Mental Health Treatments.

This report used nationally representative data on the frequency of mental health symptoms and related treatment utilization to compare men of color with non-Hispanic white men.

Men of color included non-Hispanic black and Hispanic men.

It also explored whether racial and ethnic disparities differ by age, health insurance coverage status, and income.
Methods

- Men aged 18 and over (n= 21,058)
- We pooled data from 2010-2013 to get a large enough sample size for our outcome of interest.
- Mental health and medication use data came from the Quality of Life (QOL) and the Adult Functioning and Disability (AFD) supplements to sample adult NHIS.
- Demographic and other health information (including health insurance coverage) were collected in the Core components of NHIS.
- We used a special sample adult weight on the supplemental files because our outcome of interest came from this file and we generalized our findings to the US adult population.
Figure 1-1. Percentage of men aged 18 and over with daily feelings of anxiety or depression, by race and ethnicity: United States, 2010-2013

- All races and ethnicities
- Non-Hispanic white
- Non-Hispanic black or Hispanic

Daily feelings of anxiety:
- All races and ethnicities: 7.7%
- Non-Hispanic white: 8.2%
- Non-Hispanic black or Hispanic: 6.6%

Daily feelings of depression:
- All races and ethnicities: 3.5%
- Non-Hispanic white: 3.8%
- Non-Hispanic black or Hispanic: 2.9%

Daily feelings of anxiety or depression:
- All races and ethnicities: 8.5%
- Non-Hispanic white: 9.0%
- Non-Hispanic black or Hispanic: 7.3%

1Significantly different from non-Hispanic black and Hispanic men.

Figure 1-2. Percentage of men aged 18 and over with daily feelings of anxiety or depression, by age and race and ethnicity: United States, 2010-2013

1Significantly different from men aged 45 and over in the same race and ethnicity group.
2Significantly different from non-Hispanic black and Hispanic men in the same age group.

Figure 1-3. Percentage of men who took medication or talked to a mental health professional, among men aged 18-44 who felt anxious or depressed every day, by health insurance coverage status, income, and race and ethnicity: United States, 2010-2013

<table>
<thead>
<tr>
<th>Health insurance coverage status</th>
<th>Annual income relative to the federal poverty level (FPL)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uninsured</td>
<td>Uninsured</td>
<td>12.7</td>
</tr>
<tr>
<td>Insured</td>
<td>Insured</td>
<td>48.4</td>
</tr>
<tr>
<td>Income &lt; 200% FPL</td>
<td>Income ≥ 200% FPL</td>
<td>30.5</td>
</tr>
<tr>
<td>Income ≥ 200% FPL</td>
<td></td>
<td>40.8</td>
</tr>
</tbody>
</table>

1 Non-Hispanic white
2 Non-Hispanic black or Hispanic

Note: Percentages may not sum to 100 due to rounding.
Tainya C. Clarke, Ph.D., Lindsey I. Jones, M.P.H., Barbara J. Stussman, B.A., Patricia M. Barnes, M.A., Richard L. Nahin, Ph.D.

Trends in the Use of Complementary Health Approaches Among Adults: United States, 2002 – 2012

This report presented national estimates of the use of complementary health approaches among adults in the United States across three time points.

Complementary health approaches include an array of modalities and products with a history of use or origins outside of conventional Western medicine.

Findings were generalized to the noninstitutionalized US adult population.
Methods

- The study sample included 88,962 US adults aged 18 and over.
- The study used data from 2002, 2007 and 2012 to look at differences in use within the population over time.
- Data on use of complementary health approaches came from the Alternative Health (ALT) supplements to sample adult NHIS.
- Demographic and other health information (e.g. age and gender) were collected in the Core components of NHIS.
- We used the sample adult weight because that weight was also used in the ALT supplement and we generalized our findings to the US adult population.
Figure 2-1. Trend in the use of common complementary health approaches among US adults in the past 12 months: United States, 2002-2012
In summary

We can use

- A single year of NHIS data to answer a particular research question
- Combine core files and or supplements within a year to gain detailed information on specific topics.
- Combine years to get a large enough sample size
- Combine years to look at trends over time
What’s Next for the NHIS?
## Selected 2015 NHIS Supplements

<table>
<thead>
<tr>
<th>Topic</th>
<th>Sponsor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>NCI</td>
</tr>
<tr>
<td>Heart Disease and Stroke</td>
<td>CDC/DHDSP, NIH/NHLBI, NIH/NINDS</td>
</tr>
<tr>
<td>Tobacco Use</td>
<td>FDA</td>
</tr>
<tr>
<td>Food Security</td>
<td>USDA</td>
</tr>
<tr>
<td>Enhanced Questions on Health Care Access and Utilization</td>
<td>DHHS/ASPE</td>
</tr>
<tr>
<td>Adult and Child Immunization</td>
<td>CDC/NCIRD</td>
</tr>
<tr>
<td>Child Mental Health Brief SDQ</td>
<td>SAMHSA/CMHS</td>
</tr>
</tbody>
</table>
Additional Future Plans for the NHIS

- Sample redesign in 2016
- Content redesign in 2018
- Online Analytic Real-time System (OARS) tool for use with restricted in-house and public use data
- New (to NHIS) modes of data collection
How to Learn More about the NHIS: Where to Go for Help
Navigating the NHIS Website

The National Health Interview Survey (NHIS) has monitored the health of the nation since 1957. NHIS data on a broad range of health topics are collected through personal household interviews. For over 50 years, the U.S. Census Bureau has been the data collection agent for the National Health Interview Survey. Survey results have been instrumental in providing data to track health status, health care access, and progress toward achieving national health objectives.

New in 2014: Native Hawaiian and Pacific Islander (NHPI) NHIS

Selected Participants
Have you been selected to take part in the National Health Interview Survey?

- NHIS Brochure (PDF - 715 KB)
- Folleto de NHIS (PDF - 536 KB)
- Confidentiality Brochure (PDF - 391 KB)
- Folleto de Confidencial (PDF - 765 KB)
- Early Release Brochure (PDF - 1.2 MB)

What’s New
- Racial and Ethnic Disparities in Men’s Use of Mental Health Treatments (6/2015)
- Characteristics of Children in Medicaid Managed Care and Medicaid Pre-service, 2003–2005 (PDF - 775 KB) (5/2015)
- Health Insurance Coverage: Estimates from the National Health Interview Survey, January–September 2014 (PDF - 520 KB) (3/2015)
- Selected Estimates Based on Data From the January–September 2014 National Health Interview Survey (3/2015)
- Preliminary Quarterly Microdata Files: National Health Interview Survey, January–September 2014 (PDF - 164 KB)
Reports and Products

- Microdata files, questionnaires, related products
- Annual reports of estimates (*Summary Health Statistics*)
  - Population, Children, and Adults
- Early Release Program
  - Key Health Indicators, Health Insurance, Access and Utilization, Wireless Substitution
- Quick Stats
- Data Briefs
- National Health Statistics Reports
Research Data Center (RDC)

- http://www.cdc.gov/rdc/
- http://www.cdc.gov/rdc/B1DataType/Dt1225.htm

- List of public use and restricted variables on data files
- Submit process application for research project
  - Application is reviewed by RDC for approval to proceed
- Fee

- rdca@cdc.gov
Strengths of and Challenges Facing the NHIS
Strengths of the NHIS

- Large, nationally representative sample
- Household and family based survey
- In-person survey
- Broad range of information
- Demographic detail

- Ongoing annual survey
- Topical supplementary information
- Relatively high response rates
- Links to other data sets
- Timely release
Challenges Facing the NHIS

Better data on the health of the nation

Technological changes in society

Questionnaire content

Respondent burden

Question consistency

Survey funding/cost

Data confidentiality and security issues

Hard-to-reach populations
For More Information:

To keep up with new developments, subscribe to the NHIS Listserv: http://www.cdc.gov/nchs/nhis/nhis_listserv.htm

Division of Health Interview Statistics
National Center for Health Statistics
3311 Toledo RD
Hyattsville MD 20782

THANK YOU!!