Introduction to the National Health and Nutrition Examination Survey for Dementia Researchers

Matthew A. Davis, MPH, PhD
University of Michigan

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Introduction to the National Health and Nutrition Examination Survey for Dementia Researchers

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Support
This work was supported by National Institute on Aging of the National Institutes of Health (award No. P30 AG066582) and by the Institute for Healthcare Policy and Innovation at the University of Michigan.

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Outline

- Introduce the National Health and Nutrition Examination Survey (NHANES)
- Relevant cognitive measures (NHANES 2011-12 and 2013-14 surveys)
- Analytic considerations

Objective of NHANES

Assess the health and nutritional status of adults and children in the United States.

Population-based estimates of:

- Health conditions (chronic and infectious diseases)
- Prescription medication and dietary supplement use
- Nutrition status and diet behaviors
- Environmental exposures
## The evolution of NHANES

<table>
<thead>
<tr>
<th>Survey</th>
<th>Years</th>
<th>Ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHES I</td>
<td>1960-62</td>
<td>18-79 years</td>
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</tr>
<tr>
<td>NHES III</td>
<td>1966-70</td>
<td>12-17 years</td>
</tr>
<tr>
<td>NHANES I</td>
<td>1971-75</td>
<td>1-74 years</td>
</tr>
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<td>NHANES II</td>
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<td>1988-94</td>
<td>&quot;Continuous NHANES&quot;</td>
</tr>
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<td>NHANES*</td>
<td>1999-Present</td>
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*2 year 'cycles' of data collection (99-00, 01-02, …)*
“Continuous” NHANES Sample (1999-present)

- US civilian, non-institutionalized household population
- About 5,000 people examined each year (10,000 in each survey/data release)
- Oversampled populations:
  - Hispanics
  - Non-Hispanic Blacks
  - Non-Hispanic Asian Americans (2011 - present)
  - Older persons aged 80+
  - Low income whites
NHANES Cognitive Measures (surveys 2011-12 and 2013-14)

Article
Xue Dong, Shiri Li, Jing Sun, Yan Li and Dongfeng Zhang

Association of Zinc, Iron, Copper, and Selenium Intakes with Low Cognitive Performance in Older Adults: A Cross-Sectional Study from National Health and Nutrition Examination Survey (NHANES)
Ruyun Li, Wujie Sun and Dongfeng Zhang

NHANES Cognitive Measures (surveys 2011-12 and 2013-14)

Must be . . .
• 60 years or older
• Speaker of English, Spanish, or Asian language
• Able to complete the cognitive assessment independently

Respondents that require a proxy are excluded!
<table>
<thead>
<tr>
<th>Code or Value</th>
<th>Value Description</th>
<th>Count</th>
<th>Cumulative</th>
<th>Skip to Item</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>3 tests</td>
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<td>1638</td>
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<tr>
<td>2</td>
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<tr>
<td>3</td>
<td>1 test</td>
<td>4</td>
<td>1686</td>
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</tr>
<tr>
<td>4</td>
<td>Ineligible, proxy</td>
<td>19</td>
<td>1705</td>
<td>End of Section</td>
</tr>
<tr>
<td>5</td>
<td>Ineligible, other language</td>
<td>16</td>
<td>1721</td>
<td>End of Section</td>
</tr>
<tr>
<td>6</td>
<td>No test done</td>
<td>64</td>
<td>1785</td>
<td>End of Section</td>
</tr>
<tr>
<td>.</td>
<td>Missing</td>
<td>0</td>
<td>1785</td>
<td></td>
</tr>
</tbody>
</table>

- Able to complete the cognitive assessment independently

Respondents that require a proxy are excluded!

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**NHLAS Cognitive Measures**
(surveys 2011-12 and 2013-14)

**Components**

1) **Word learning and recall**
   - Based on Consortium to Establish a Registry for Alzheimer’s Disease (CERAD)
   - Three learning trials (10 words)
   - One delayed learning trial (8-10 mins after)

2) **Animal fluency test** *(scores 0 to ∞)*
   - Name as many animals as possible *(1 min)*

3) **Digit symbol substitution test** *(scores 0 to 133)*
   - Wechsler Adult Intelligence Scale *(WAIS III)*
   - Nine number-symbol pairs presented
   - Sketch symbols to numbers *(2 min)*
NHANES Cognitive Measures
(surveys 2011-12 and 2013-14)

Components

1) Word learning and recall
   - Based on Consortium to Establish a Registry for Alzheimer's Disease (CERAD)
   - Three learning trials (10 words)
   - One delayed learning trial (5-10 min)

2) Animal fluency test
   - Name as many animals as possible

3) Digit symbol substitution test
   - Wechsler Adult Intelligence Scale (WAIS)
   - Nine number-symbol pairs presented
   - Sketch symbols to numbers (2 min)

The NHANES website

https://www.cdc.gov/nchs/nhanes/
Analytic Considerations

- Tutorials located on the NHANES website
- Step-by-step guide to analyzing NHANES data using examples
  - Topics covered: From merging data files to running regression models
- Available for different software packages (i.e., Stata, SAS, and SUDAAN)
Analytic Considerations

- Cannot download one data file with all NHANES data
- Must merge data files (one-to-one) together using respondent’s ID (using identification number, variable: SEQN)
- Start with demographics and merge other data files

Interview weight

In-home interview

• Demographic information
• Health conditions and health care use
• Rx and dietary supplement use
• Health insurance

Exam weight

Exam

• Physical exam measures
• Lab measures
Analytic Considerations

- Must use appropriate weights when performing analyses generalizable to the US population
- Depends on the data…
  - Household interview data = interview weight
  - Exam or lab data = exam weight
  - Both household and exam/lab data = exam weight
  - Weight variables are located in the demographics file

Not all NHANES data are publicly available

- Only accessible via NCHS's Research Data Center
- Restricted data include:
  - Linked administrative data
  - All data on respondents' locations
  - Census region, block group, census tract, county, state, and latitude/longitude
  - Some information from children < 19 years
  - Drug and alcohol use, sexual activity, mental health
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</tr>
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<tbody>
<tr>
<td>Blood &amp; Urine analyses</td>
<td>99-00</td>
<td></td>
</tr>
<tr>
<td>Blood pressure</td>
<td>01-02</td>
<td></td>
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<tr>
<td>Body measures</td>
<td>03-04</td>
<td></td>
</tr>
<tr>
<td>Bone composition &amp; bone mineral density</td>
<td>05-06</td>
<td></td>
</tr>
<tr>
<td>Dental caries and Edentulism</td>
<td>07-08</td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>09-10</td>
<td></td>
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<tr>
<td>Dietary Intake</td>
<td>11-12</td>
<td></td>
</tr>
<tr>
<td>Private Interviews</td>
<td>13-14</td>
<td></td>
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<tr>
<td>Hearing and Ear Functioning (Audio)</td>
<td>15-16</td>
<td></td>
</tr>
<tr>
<td>Vision</td>
<td>17-18</td>
<td></td>
</tr>
<tr>
<td>CV Fitness</td>
<td>19-20</td>
<td></td>
</tr>
<tr>
<td>Muscle strength (grip test)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eye Diseases (FDT and Retinal Imaging)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity (PAM)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pubertal Maturation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respiratory diseases (COPD / asthma)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taste and smell</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Liver disease &amp; cirrhosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuberculosis (TB skin test)</td>
<td>x</td>
<td></td>
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<tr>
<td>Lower extremity disease</td>
<td></td>
<td></td>
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<tr>
<td>Mental health (other than depression)</td>
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<tr>
<td>Arthritis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balance</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Physical functioning (Timed walk)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin disorders (Dermatology)</td>
<td>x</td>
<td></td>
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Recruitment letter

Study eligibility screening

In-home interview

Exam

- Demographic information
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https://capra.med.umich.edu/

CAPRA Seminar Series \ YouTube channel

Minding Memory
A podcast devoted to exploring research on Alzheimer’s disease and other types of dementia
Hosted by Matthew Davis & Donovan Maust