Monitoring cardiovascular risk factors in the US population

Cynthia Ogden, PhD, MRP & Cheryl Fryar, MSPH
Goals of National Health and Nutrition Examination Surveys (NHANES)

U.S. population-based estimates of:

- Health conditions
- Awareness, treatment and control of selected diseases
- Environmental exposures
- Nutritional status and diet behaviors
## National Health and Nutrition Examination Surveys

<table>
<thead>
<tr>
<th>Survey</th>
<th>Dates</th>
<th>Ages</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHES I</td>
<td>1960-62</td>
<td>18-79 years</td>
</tr>
<tr>
<td>NHES II</td>
<td>1963-65</td>
<td>6-11 years</td>
</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>
<tr>
<td>NHANES II</td>
<td>1976-80</td>
<td>6 mo.-74 years</td>
</tr>
<tr>
<td>HHANES</td>
<td>1982-84</td>
<td>6 mo.-74 years</td>
</tr>
<tr>
<td>NHANES III</td>
<td>1988-94</td>
<td>2 mo. +</td>
</tr>
<tr>
<td>Survey</td>
<td>Dates</td>
<td>Ages</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
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</tr>
<tr>
<td>NHANES</td>
<td>1999-2000</td>
<td>All ages</td>
</tr>
<tr>
<td>NHANES</td>
<td>2001-2002</td>
<td>All ages</td>
</tr>
<tr>
<td>NHANES</td>
<td>2003-2004</td>
<td>All ages</td>
</tr>
<tr>
<td>NHANES</td>
<td>2005-2006</td>
<td>All ages</td>
</tr>
<tr>
<td>NHANES</td>
<td>2007-2008</td>
<td>All ages</td>
</tr>
<tr>
<td>NHANES</td>
<td>2009-2010</td>
<td>All ages</td>
</tr>
<tr>
<td>NHANES</td>
<td>2011-2012</td>
<td>All ages</td>
</tr>
</tbody>
</table>
Sample

• US Civilian, non-institutionalized population
• All ages
• Oversample:
  – African Americans
  – Asian Americans
  – Hispanics/Latinos
  – Older persons aged 60+
  – Low income whites
Stage 1
Counties

Stage 2
Segments

Stage 3
Households

Stage 4
SPs
Interview

• Broad range of health conditions
• Health-related behaviors and exposures
• Health care utilization
• Health insurance
• Prescription medications
• Dietary supplements
Mobile examination center
Cardiovascular health
Laboratory
Mobile exam center laboratory

- Complete blood count
- Pregnancy test
- Specimen processing
  - Blood, urine, water, swabs, wipes
  - 300 assays
  - 24 laboratories
Laboratory tests

- Nutritional biomarkers
- Hormone tests
- Diabetes
- Lipids, CRP
- Biochemistry profile
- Infectious diseases
- Environmental exposures
NHANES response rates 1999-2010

Interviewed

Examined
Health Insurance Affects Diagnosis and Control of Hypercholesterolemia and Hypertension Among its Aged 20–64: United States, 2005–2008

- Ph.D. Diane M. Makuc, Dr.P.H., Cindy Zhang, M.D., M.P.H., An Espinosa, M.S., and Vicki Farr, Sc.M., Ph.D.
Percent of adults with high serum total cholesterol, US, 2009-2010

Greater than or equal to 240 mg/dL; 1 Significantly different from non-Hispanic white; 2 Significantly different from non-Hispanic black; 3 Significantly different from men in the same race/ethnicity group. SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey. Carroll et al NCHS Data Brief 2012
Trends in the percent of adults with high serum total cholesterol, US, 1999-2010

† A serum total cholesterol greater than or equal to 240 mg/dL  *Significant decreasing trends (p<0.005) NOTES: HP 2010 = Healthy People 2010 Objective (17%). SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey.
Percent of adults with low HDL, US, 2009-2010

<table>
<thead>
<tr>
<th>Percent</th>
<th>All race ethnic groups</th>
<th>NH White</th>
<th>NH black</th>
<th>Hispanics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both sexes</td>
<td>21.3</td>
<td>16.4</td>
<td>24.8</td>
<td>31.4</td>
</tr>
<tr>
<td>Men</td>
<td>20.7</td>
<td>35.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>11.9</td>
<td>12.9</td>
<td>14.6</td>
<td></td>
</tr>
</tbody>
</table>

†Less than 40 mg/dL 1 Significantly different from non-Hispanic white 2 Significantly different from non-Hispanic black 3 Significantly different from men in the same race/ethnicity group

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey
Statin drug use in the past 30 days

### Men

- **45–64 years**
  - 1988–1994: 3%
  - 1999–2002: 15%
  - 2005–2008: 18%

- **65–74 years**
  - 1988–1994: *
  - 1999–2002: 26%
  - 2005–2008: 50%

- **75 years and over**
  - 1988–1994: *
  - 1999–2002: 19%
  - 2005–2008: 45%

### Women

- **45–64 years**
  - 1988–1994: 2%
  - 1999–2002: 10%
  - 2005–2008: 16%

- **65–74 years**
  - 1988–1994: *
  - 1999–2002: 5%
  - 2005–2008: 24%

- **75 years and over**
  - 1988–1994: *
  - 1999–2002: 2%
  - 2005–2008: 18%

*Estimates are considered unreliable. Data preceded by an asterisk have a relative standard error (RSE) of 20%–30%. Data not shown have an RSE of greater than 30%.

SOURCE: CDC/NCHS, *Health, United States, 2010*, Figure 17. Data from the National Health and Nutrition Examination Survey.
Uncontrolled high blood pressure for adults with hypertension

NOTE: Uncontrolled high blood pressure is a measured systolic blood pressure of at least 140 mm Hg or a measured diastolic blood pressure of at least 90 mm Hg among those with measured high blood pressure or who reported taking antihypertensive medication.

SOURCE: CDC/NCHS, Health, United States, 2011, Figure 9. Data from the National Health and Nutrition Examination Survey.
Hypertension is more likely to be uncontrolled, and more likely to be undiagnosed, among uninsured adults with the condition than among those with health insurance.

Figure 3. Uncontrolled hypertension among adults aged 20–64 with hypertension, by insurance coverage and age: United States, 2005–2008

*Significantly different from those with private health insurance and those with public health insurance.

NOTE: Access data table for Figure 3 at: http://www.cdc.gov/nchs/data/databriefs/db57_tables.pdf#3.

NHANES and Million Hearts
## Status of the ABCS

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspirin</td>
<td>People at increased risk of cardiovascular disease who are taking aspirin</td>
<td>47%</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>People with hypertension who have adequately controlled blood pressure</td>
<td>46%</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>People with high cholesterol who have adequately controlled hyperlipidemia</td>
<td>33%</td>
</tr>
<tr>
<td>Smoking</td>
<td>People trying to quit smoking who get help</td>
<td>23%</td>
</tr>
</tbody>
</table>

Prevalence of Uncontrolled Risk Factors for Cardiovascular Disease: United States, 1999–2010
Cheryl D. Fryar, M.S.P.H.; Te-Ching Chen, Ph.D.; and Xianfen Li, M.S.

Key findings
Data from the National Health and Nutrition Examination Survey
- In 2009–2010, about 47% of adults had at least one of three risk factors for cardiovascular disease—uncontrolled high blood pressure, uncontrolled high levels of low-density lipoproteins (LDL) cholesterol, or current smoking.
- Men were more likely than women to have at least one of the three cardiovascular disease risk factors.
- From 1999–2000 through 2009–2010, a decrease was observed in the percentage of non-Hispanic white and Mexican-American adults who had at least one of the three risk factors for cardiovascular disease. However, this decrease was not found among non-Hispanic black adults.
- The prevalence of uncontrolled high blood pressure and of uncontrolled high LDL cholesterol declined between 1999–2000 and 2009–2010, but no significant changes occurred in the percentage of adults who smoke cigarettes.

Heart disease is the leading cause of death in the United States (1). High blood pressure, high cholesterol, and smoking are all risk factors that could lead to cardiovascular disease (CVD) and stroke. The recently announced Million Hearts Initiative is aimed at preventing 1 million heart attacks and strokes over the next 5 years (2–6). This report expands on results previously published (2) by presenting the most recent prevalence estimates and trends uncontrolled high blood pressure, uncontrolled high levels of low-density lipoproteins cholesterol (LDL-C), and current cigarette smoking among adults aged 20 and over.

Keywords: uncontrolled high blood pressure • uncontrolled high cholesterol • smoking • National Health and Nutrition Examination Survey

Did the percentage of adults who have at least one of three CVD risk factors change from 1999 through 2010?
During 1999–2010, a decreasing trend was observed in the percentage of adults with at least one of three risk factors for CVD, from 57.8% (about...
The 3 Risk Factors
Uncontrolled High Blood Pressure

Measured systolic blood pressure $\geq 140$ mm Hg or a diastolic blood pressure $\geq 90$ mm Hg, based on the average of up to three measurements.

Persons may or may not have been taking medication.
Uncontrolled High LDL-Cholesterol

Measured levels of LDL cholesterol above the treatment goals established by the National Cholesterol Education Program (NCEP) Adult Treatment Panel-III (ATP-III) guidelines: <160 mg/dL, <130 mg/dL, and <100 mg/dL for low-, intermediate-, and high-risk groups, respectively.

Persons may or may not have been taking medication.
Smoker

Person reporting that they smoked at least 100 cigarettes in their lifetime and now smoke every day or some days, or a measured serum cotinine (the primary nicotine metabolite) level >10 ng/mL.
Prevalence and number of US adults who smoke or have uncontrolled high BP or uncontrolled high cholesterol

Linear trend in prevalence significant (p<0.01) after adjustment for sex, age group, race/ethnicity, and poverty-income ratio. MMWR Sept 2011. Updated with 2009-10 data.
### Percentage of US adults with at least 1 risk factor

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Both</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>46.5</td>
<td>51.6</td>
<td>41.6</td>
</tr>
<tr>
<td>20-39 years</td>
<td>41.8</td>
<td>48.6</td>
<td>34.4</td>
</tr>
<tr>
<td>40-59 years</td>
<td>47.0</td>
<td>53.8</td>
<td>40.5</td>
</tr>
<tr>
<td>60+ years</td>
<td>53.7</td>
<td>53.4</td>
<td>45.3</td>
</tr>
</tbody>
</table>

**Source:** CDC/NCHS, National Health and Nutrition Examination Survey 2009-2010
Percentage of men with at least 1 risk factor, by age: US, 1999-2010

Source: National Health and Nutrition Examination Surveys; Fryar et al 2012 NCHS Data Brief
Percentage of women with at least 1 risk factor, by age: US, 1999-2010

Source: National Health and Nutrition Examination Surveys; Fryar et al 2012 NCHS Data Brief
Percentage of adults with at least 1 risk factor, by sex and age: US, 1999-2010

Source: National Health and Nutrition Examination Surveys; Fryar et al 2012 NCHS Data Brief
Sex specific results

- 1999-2010 decrease
  - Men 40-59 and 60+ years
  - Women 60+ years
- Men more likely
- Older women more likely than younger
Percentage of adults with at least 1 risk factor, by race/ethnicity: US, 1999-2010

Source: National Health and Nutrition Examination Surveys; Fryar et al 2012 NCHS Data Brief
Race/ethnicity specific results

- 1999-2010 decrease
  - Non-Hispanic white adults
  - Mexican American adults
- Non-Hispanic black adults more likely
Percentage of adults with at least 1 risk factor, by poverty level: US, 1999-2010

Source: National Health and Nutrition Examination Surveys; Fryar et al 2012 NCHS Data Brief
PIR specific results

- 1999-2010 decrease
  - All income groups
- Lowest income adults more at likely
Percentage of adults who smoke: US, 1999-2010

Source: National Health and Nutrition Examination Surveys; Fryar et al 2012 NCHS Data Brief
Percentage of adults with uncontrolled high LDL cholesterol: US, 1999-2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999-2000</td>
<td>32.6</td>
</tr>
<tr>
<td>2001-2002</td>
<td>29.1</td>
</tr>
<tr>
<td>2003-2004</td>
<td>24.6</td>
</tr>
<tr>
<td>2005-2006</td>
<td>21.9</td>
</tr>
<tr>
<td>2007-2008</td>
<td>21.9</td>
</tr>
<tr>
<td>2009-2010</td>
<td>23.3</td>
</tr>
</tbody>
</table>

Source: National Health and Nutrition Examination Surveys; Fryar et al 2012 NCHS Data Brief
Percentage of adults with uncontrolled high blood pressure: US, 1999-2010

Source: National Health and Nutrition Examination Surveys; Fryar et al 2012 NCHS Data Brief
Percentage of adults with at least 1 risk factor: US, 1999-2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999-2000</td>
<td>57.8</td>
</tr>
<tr>
<td>2001-2002</td>
<td>55.3</td>
</tr>
<tr>
<td>2003-2004</td>
<td>54.2</td>
</tr>
<tr>
<td>2005-2006</td>
<td>51.5</td>
</tr>
<tr>
<td>2007-2008</td>
<td>49.7</td>
</tr>
<tr>
<td>2009-2010</td>
<td>46.5</td>
</tr>
</tbody>
</table>

Source: National Health and Nutrition Examination Surveys; Fryar et al 2012 NCHS Data Brief
Individual risk factors

- 1999-2010 decrease
  - Uncontrolled high blood pressure
  - Uncontrolled high LDL cholesterol
NHANES and CVD risk factors

• NHANES resource for monitoring trends

• Percent of US adults with 1+ risk factor
  ➢ Decrease 1999-2010
  ➢ Not among African Americans
  ➢ Men, older adults, African Americans, lower income adults more likely to have risk factors

• Percent of US adults with Individual risk factors
  ➢ Decrease in uncontrolled high blood pressure and uncontrolled high LDL cholesterol
  ➢ No significant change in smoking
Thank you to our colleagues

Margaret Carroll, MSPH
Te-Ching Chen, PhD
Xianfen Li, MS

Disclaimer

The findings and conclusions in this presentation are those of the author and not necessarily of CDC