PhenX: Nutrition & Dietary Supplements

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NHGRI

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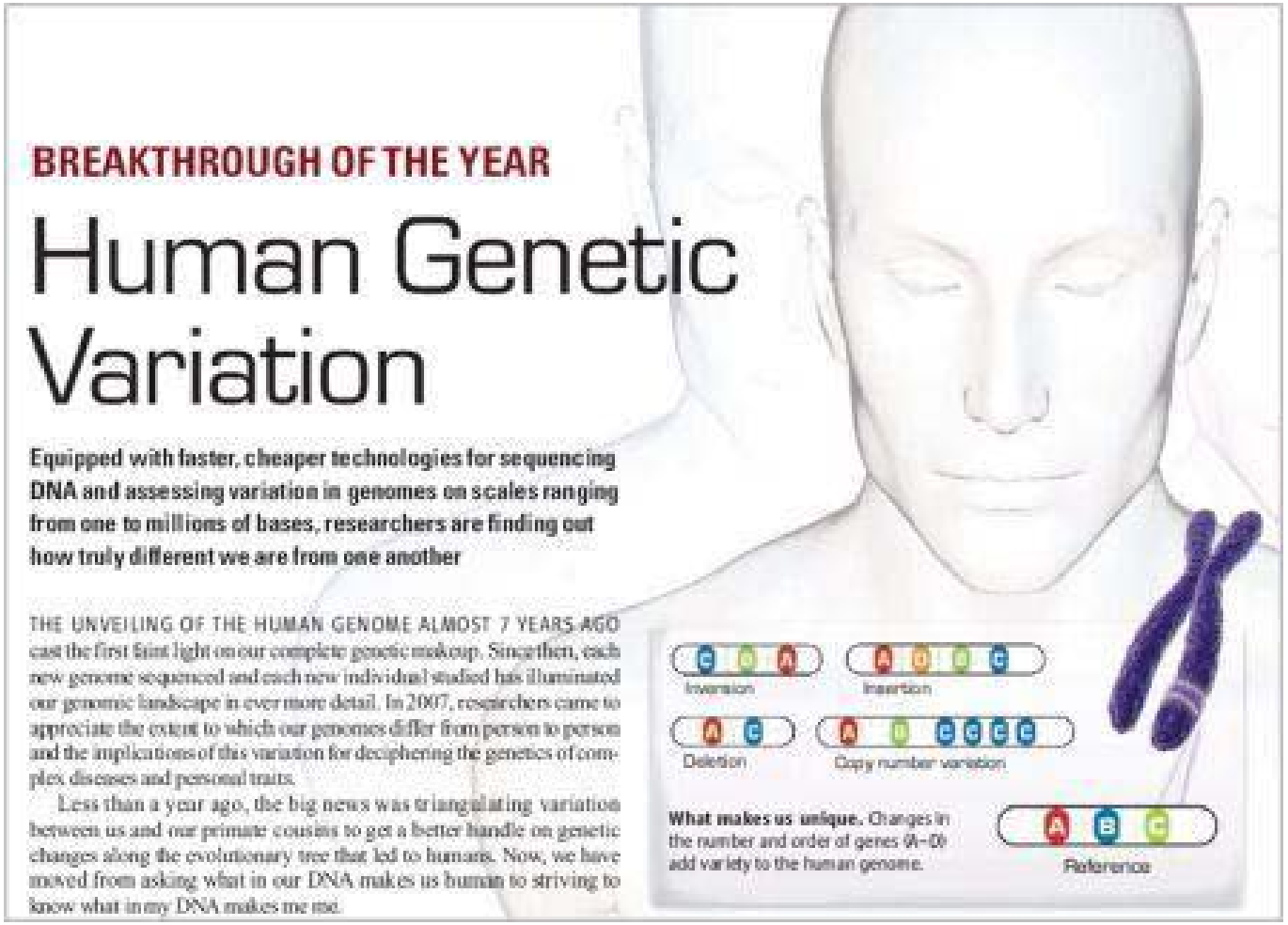
NHGRI Office of Population Genomics

- Established to facilitate application of genomic knowledge to health, by promoting multi-disciplinary research, applying genomic technologies to population and clinical studies, and developing new population resources for investigation of genetic and environmental contributions to complex diseases.

- Goals:
  - Establish research resources to identify genes related to complex diseases and their environmental modifiers
  - Build successful NIH-wide collaborations in population-based genomics research
  - Support cross-disciplinary training for genetics, epidemiologist, clinical researchers, and clinicians

http://www.genome.gov/19518660

2007: The Year of GWA Studies



BREAKTHROUGH OF THE YEAR

Human Genetic Variation

Equipped with faster, cheaper technologies for sequencing DNA and assessing variation in genomes on scales ranging from one to millions of bases, researchers are finding out how truly different we are from one another

THE UNVEILING OF THE HUMAN GENOME ALMOST 7 YEARS AGO cast the first faint light on our complete genetic makeup. Since then, each new genome sequenced and each new individual studied has illuminated our genomic landscape in ever more detail. In 2007, researchers came to appreciate the extent to which our genomes differ from person to person and the implications of this variation for deciphering the genetics of complex diseases and personal traits.

Less than a year ago, the big news was triangulating variation between us and our primate cousins to get a better handle on genetic changes along the evolutionary tree that led to humans. Now, we have moved from asking what in our DNA makes us human to striving to know what in my DNA makes me me.

Inversion

Insertion

Deletion

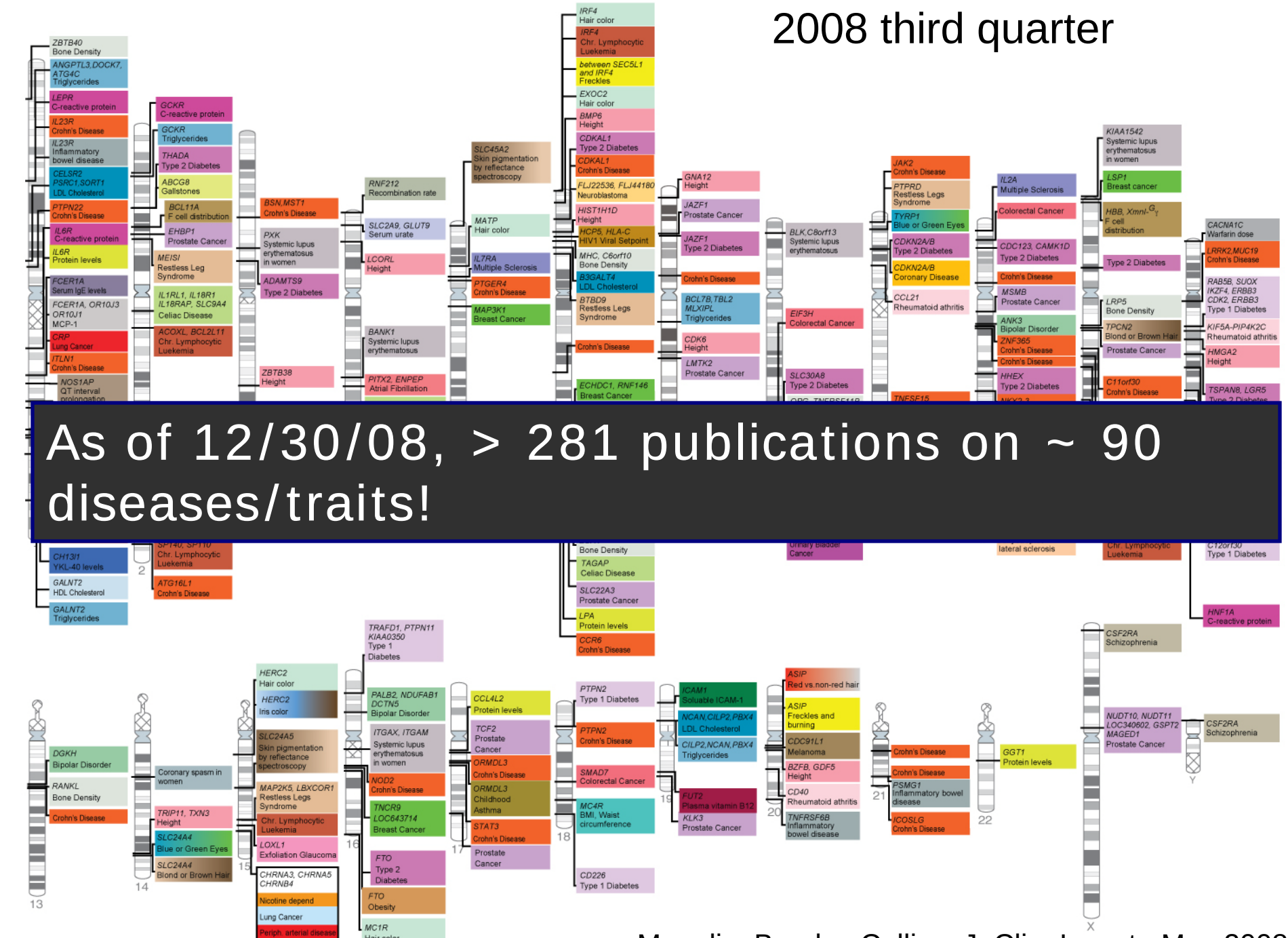
Copy number variation

What makes us unique. Changes in the number and order of genes (A–D) add variety to the human genome.

Reference

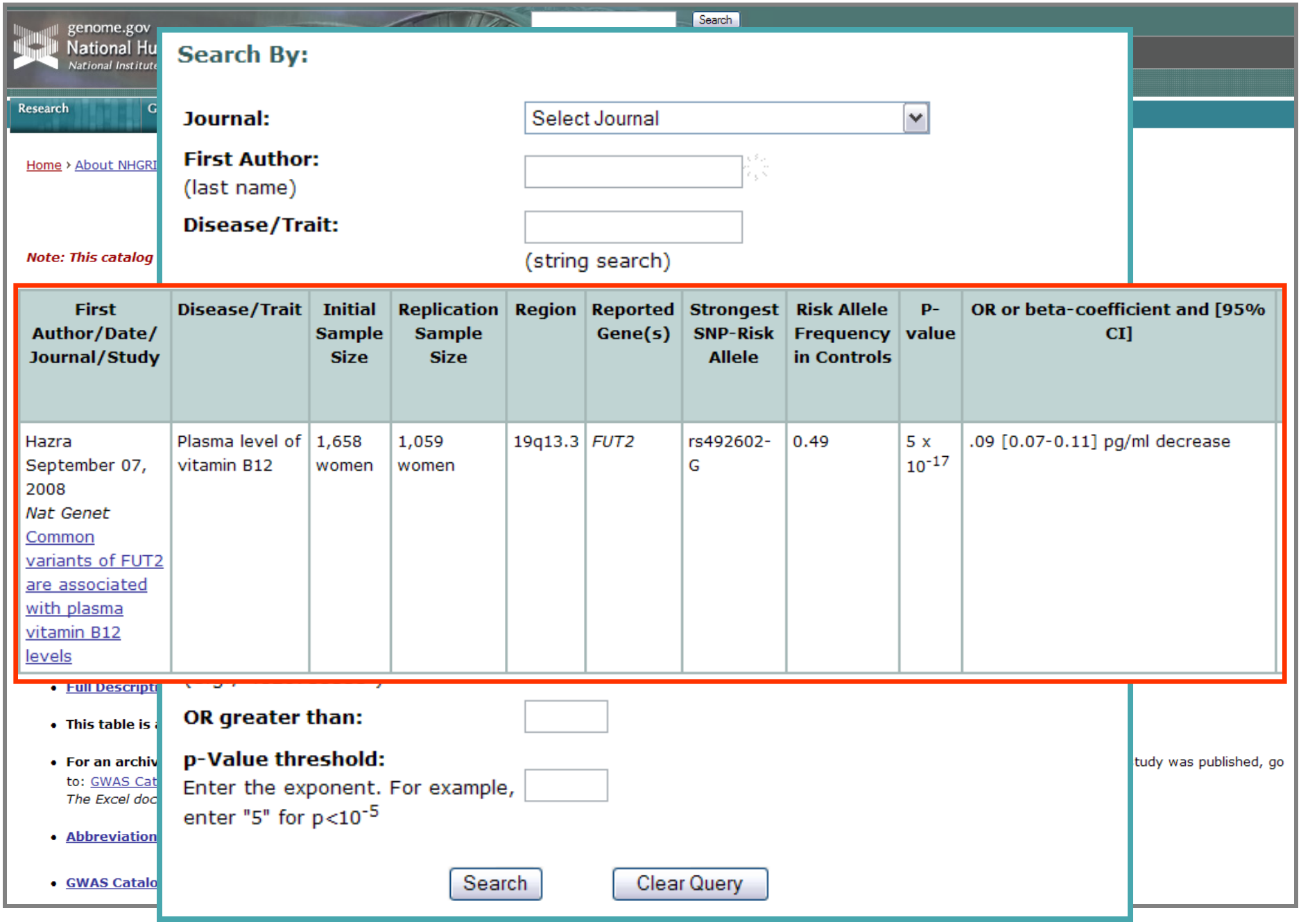
Pennisi E, *Science* 2007; 318:1842-43.

2008 third quarter



As of 12/30/08, > 281 publications on ~ 90 diseases/traits!

Manolio, Brooks, Collins, J. Clin. Invest., May 2008

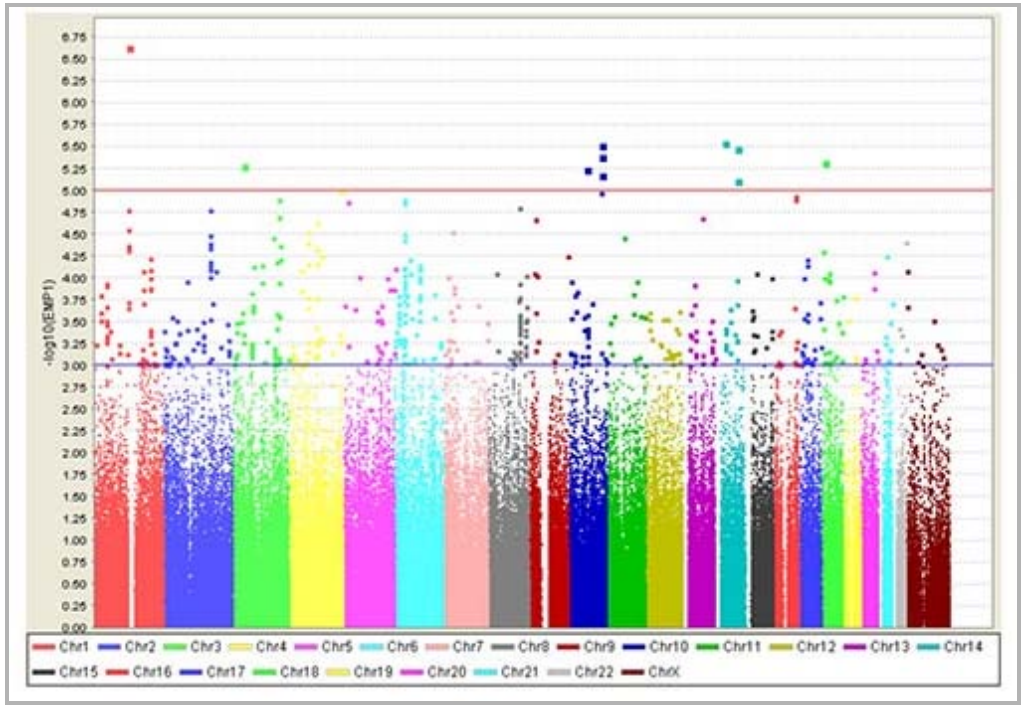


First Author/Date/ Journal/Study	Disease/Trait	Initial Sample Size	Replication Sample Size	Region	Reported Gene(s)	Strongest SNP-Risk Allele	Risk Allele Frequency in Controls	P-value	OR or beta-coefficient and [95% CI]
Hazra September 07, 2008 *Nat Genet* Common variants of FUT2 are associated with plasma vitamin B12 levels	Plasma level of vitamin B12	1,658 women	1,059 women	19q13.3	*FUT2*	rs492602-G	0.49	5 x 10^{-17}	.09 [0.07-0.11] pg/ml decrease

(http://genome.gov/gwastudies)

Standard Measures Needed

Type 2 Diabetes GWAS (>380K SNPs)



(www.broad.mit.edu/diabetes/scandinavs/type2.html)

- Combining studies increases ability to detect loci with moderate effect size (G x G; G x E interactions)
- Once genome is characterized it can be related to any trait consistent with informed consent
- Potential for cross-study analysis limited by lack of standardized measures

Standard Measures Needed

- **Multi-IC Symposia on Applying Genomics Technologies to Population Studies (2006)**
  - Recommendations:
    - Limited subsets of phenotypic and exposure data that are amenable to common definition and standardized collection in GWAS should be identified in near future
    - Better methods for phenotyping (**rigorous, standardized, inexpensive, non-invasive, limited burden, appropriate for asymptomatic individuals**) are needed, particularly for phenotypes relevant to a wide variety of diseases and disabilities
- **Frontiers in Population Genomics (2007)**
  - Recommendations:
    - Identify a subgroup of phenotypes and exposures with strong genetic associations for standardization and addition to GWAS
    - Support the review of phenotype and exposure data deposited in dbGaP to identify the most common measures and those that can be used in multiple studies.

The PhenX Project (www.phenx.org)

- PI: Carol Hamilton (RTI)
- Resource of established measures that can be incorporated into existing and future study protocols (e.g. GWAS and other genomic research efforts)
- PhenX Toolkit will include 15 standardized measures for 20 research domains
- **Challenge:** Selecting 15 measures that are low burden, but still useful

PhenX Goals

- Select 15 low burden, useful measures for 20 research domains
  - Domains are selected by the Steering Committee
  - Measures & protocols are chosen by expert Working Groups
  - Scientific community has the opportunity to review and comment on initial set of 25 measures (via Web-based survey)

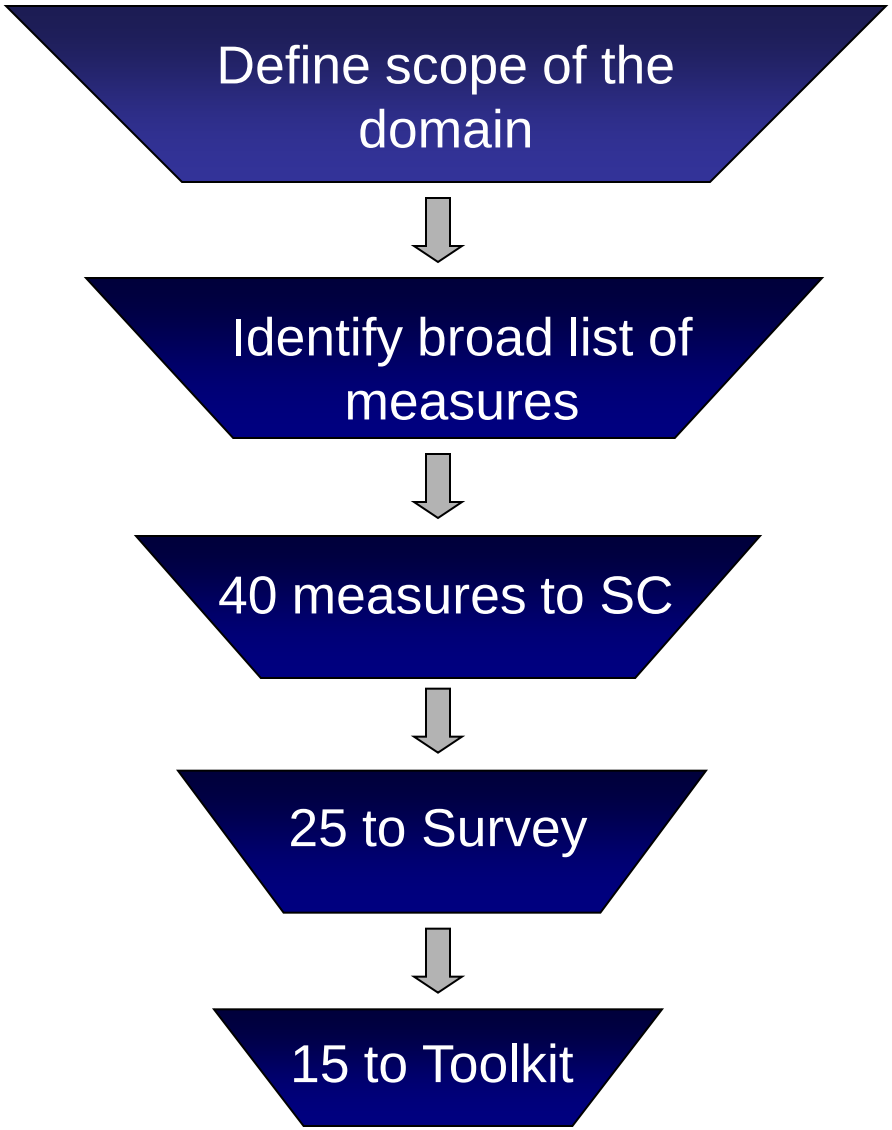
- Final set of measures made available to the research community via the PhenX Toolkit
  - Ensure that their study will be compatible with others that also incorporate PhenX measures
  - Combine studies to increase statistical power and the ability to identify genes associated with complex diseases

PhenX Domains (N=20)

- Alcohol, Tobacco, and Other Substances*
- Anthropometrics*
- Cancer*
- Cardiovascular*
- Demographics*
- Diabetes
- Nutrition and Dietary Supplements*
- Environmental Exposures*
- Gastrointestinal
- Infectious Disease and Immunity
- Lung Function
- Neurological
- Ocular
- Oral Health*
- Activity and Physical Fitness
- Psychiatric
- Psychosocial
- Renal Function
- Reproduction
- Skin, Bone, Muscle, and Joint

* In process or completed

Process for selecting PhenX measures



- Criteria for measures:
  - Low burden
  - Good measurement properties
  - Acceptable to the community
  - Viable in the future
- Can have more than 1 protocol
  - e.g. age-specific or gender specific

PhenX Toolkit

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Welcome to the PhenX Toolkit

Use the Toolkit to browse, search and select PhenX Measures for use in genome-wide association studies (GWAS) or other types of studies. The Measures were selected by PhenX Working Groups composed of domain experts. For each Measure, the Toolkit has associated protocol(s), references, and links to resources. Use of PhenX Measures will help make your study compatible with other studies that also incorporate PhenX Measures. For more information about PhenX, please visit www.phenx.org.

After you have selected Measures you want to incorporate in your study, you will have the opportunity to generate a Report that will provide the information you need to incorporate PhenX Measures into your study.

Toolkit Guidance

Release Notes: Initial Release 1/2009

This is the initial release of the Toolkit. This version contains Demographics and Alcohol, Tobacco and Other Substances Measures.

This initial version **does not include registration**. In the future, registration will allow you to save the contents of your Cart and also allow you to interact with other Toolkit users.

Domain

A PhenX Domain is a field of research with a unifying theme and easily enumerated quantitative and qualitative Measures.

Measure

A PhenX Measure refers broadly to a standardized way of capturing data on a certain characteristic of, or relating to a study subject.

Protocol

A PhenX Protocol is a standard procedure recommended by a Working Group for investigators to collect and record a PhenX Measure.

Related Links

These external links navigate away from the PhenX Toolkit:

dbGAP | PhenX

PhenX Toolkit Contents

- Recommended measures for each Domain
- Detailed, standard protocols for collecting the measures
- Methods to harmonize measures – as needed
- Supporting documentation
  - Rationale for inclusion
  - References
  - Links to resources that include the measures (e.g., dbGaP)
  - Links to resources that provide in-depth information about additional measures
- Information about the measures – recognized standards, compatibility

PhenX

Nutrition and Dietary Supplements Working Group (WG)

Working Group Members

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Working Group Timeline

- Introductory Call: 11/03/2008
- Conference Call: 12/09/2008
- In-person Meeting: 12/17/2008
- Conference Call: 03/06/2009
- Survey Launch: Spring, 2009
- Tool Kit Release: Summer, 2009

Initial Scope of the Domain

- Dietary components
  - Vitamins, Minerals, Macro Nutrients
- Food groups
  - dairy, fruits, vegetables, grains, fats, alcohol, etc
- Supplements
  - Multivitamins, single vitamins
  - Alternative supplements (e.g. soy, gingko, fish oils)
  - Meal replacements (e.g. protein bars)
- Infant feeding
  - Breastfed
  - Formula
  - Introduction of solid foods
- Food toxins
  - Endogenous (Mercury, PCBs)
  - Derived (Acrylamide, HCAs)
- Away from home food consumption
  - Fast food, traditional restaurants
- Food sufficiency
- Food preparation
  - Grilling
  - Frying
  - Microwaving, etc
- Water

Recommended Measures

- Total Dietary Intake
- Supplement Intake
- Selenium
- Vitamin D
- Breast Feeding

Studies & Instruments Reviewed

- Black Women's Health Study
- Block Questionnaire
- Behavioral Risk Factor Surveillance System
- Questionnaire (BRFSS)
- Daily Food Checklist
- Diet History Questionnaire
- Framingham Heart Study
- Jackson Heart Study
- National Health Interview
- NHANES
- Willett (Harvard Food Frequency) Questionnaire
- Women's Health Initiative
- 5-A-Day for Better Health

Protocol Selection

- The WG considered pros & cons of various protocols:
  - FFQ's, 24 hour recall, Short Dietary Assessments (Screeners), Bioassays

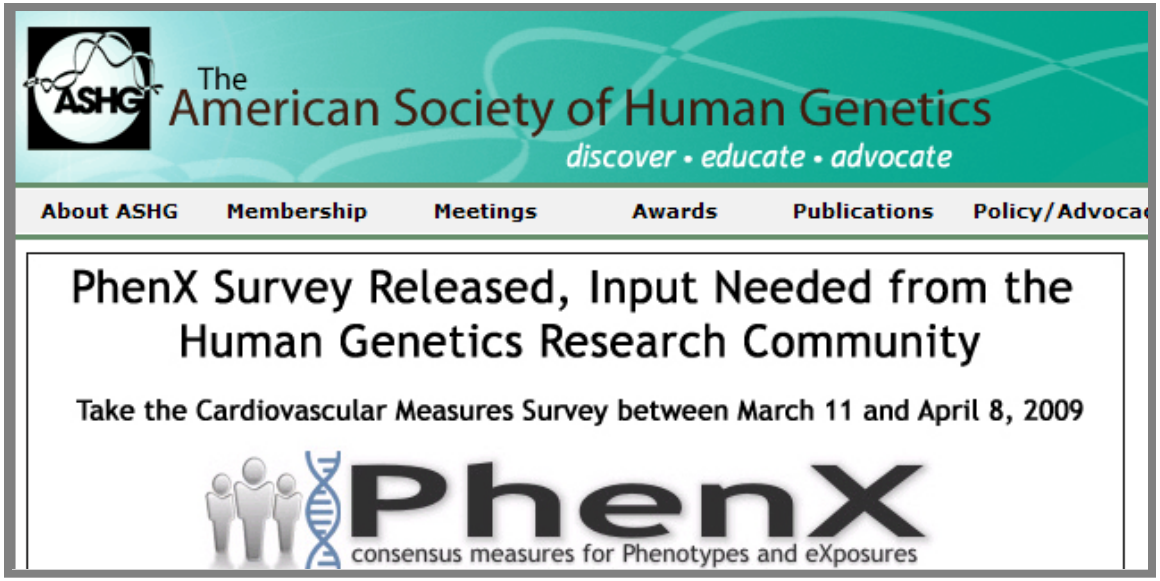
- The following protocols to be included in PhenX Survey:
  - 24 hour recall (Multiple Pass) for
    - Total Dietary Intake
    - Supplement Intake
  - Bioassay (NHANES laboratory protocol) for
    - Selenium
    - Vitamin D
  - Short Dietary Assessment (NHANES questions) for
    - Breast Feeding

Short Dietary Assessments (Screeners)

- Single and Multi-Factor including:
  - Fruits and Vegetables
  - Dairy
  - Added Sugars
  - Calcium
  - Fiber
  - Supplements
  - Caffeine

PhenX Survey

- Survey is sent out to the larger research community
  - Obtain opinions regarding the priority and appropriateness of the measures
  - Assess the acceptability, feasibility, and usability of each of the measures
  - Determine utility of the measurement protocols
- Facilitate consensus, outreach, and acceptance of the priority measures
- Your input welcome!



Steering Committee Members

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Acknowledgements

- OPG Colleagues
  - Heather Junkins
  - Teri Manolio
- SC Members
- WG Members
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  - Jim Ostell
  - Karl Sirotkin
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  - Joe Pratt
  - Anne-Lyne McCalla
  - Survey Team
  - Web Team

Websites

- www.phenx.org
  - Register to receive periodic updates via e-mail of the PhenX Newsletter and notification of new surveys
- www.phenxtoolkit.org
  - Additional domains and protocols will be added as they become available
- www.genome.gov/gwastudies/
  - A Catalog of Published Genome-Wide Association Studies

What is a GWAS

- Method for interrogating all 10 million variable points across human genome
- Variation inherited in groups, or blocks, so not all 10 million points have to be tested
- Blocks are shorter (so need to test more points) the less closely people are related
- Technology now allows studies in unrelated persons, assuming 5,000 – 10,000 base pair lengths in common (300,000 – 1,000,000 markers)

PhenX Definitions

- Domain
  - field of research with a unifying theme and easily enumerated measures
  - e.g. Alcohol, Tobacco, & Other Substance Use
- Domain Element
  - group of measures and conditions that enclose similar assessments and concepts
  - e.g. alcohol consumption, tobacco consumption, nicotine dependence
- Measure
  - refers broadly to a standardized way of capturing data on a certain characteristic of or related to a study subject (including exposures, clinical assessments, and quantitative and qualitative traits)
  - e.g. Fagerstrom Index to measure nicotine dependence

PhenX Toolkit

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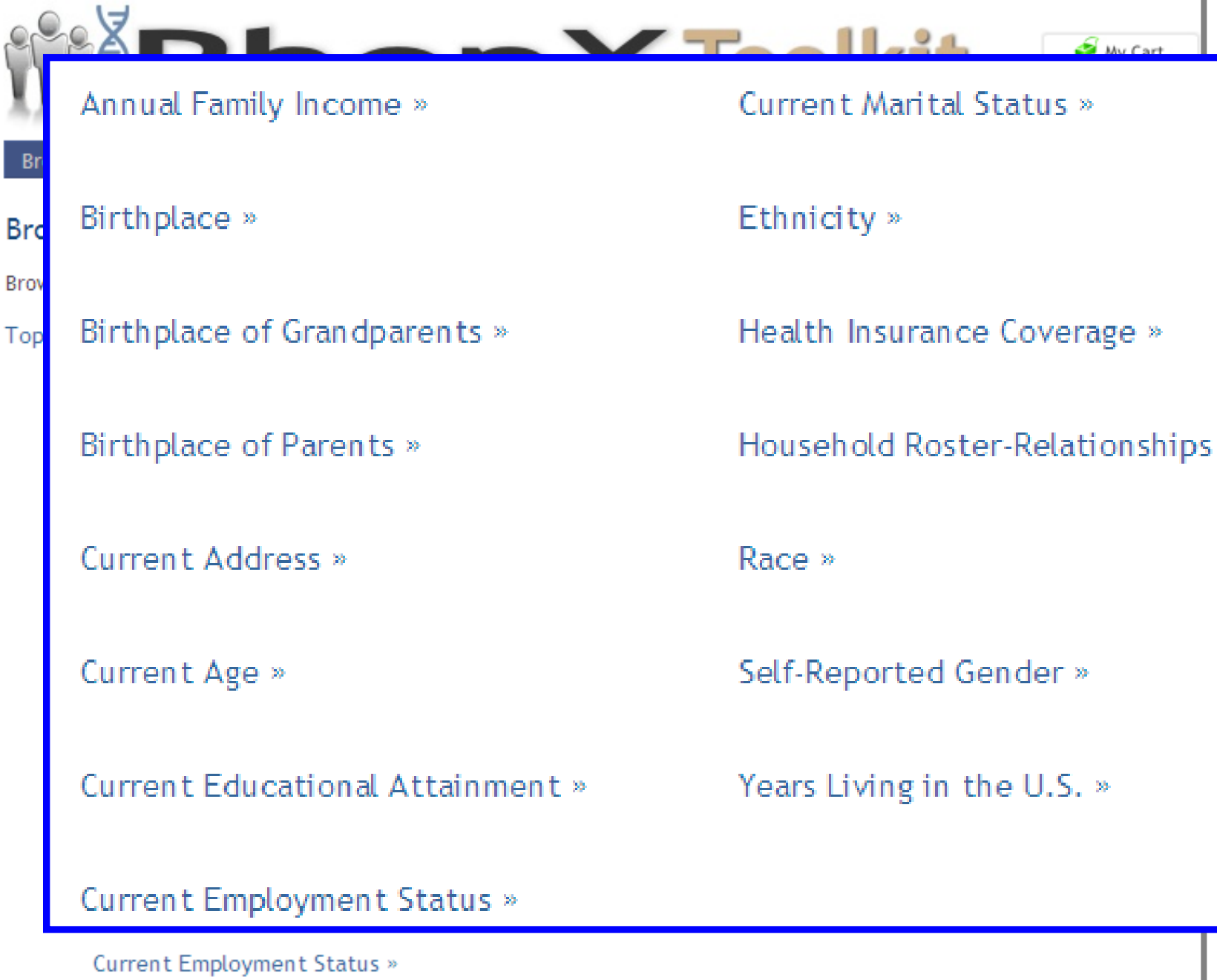
Browse Domains

Browse through Domains to view Measures and Protocols that belong to a Domain.

- Alcohol, Tobacco and Other Substances (14) »
- Anthropometrics »
- Cardiovascular »
- Demographics (15) »
- Nutrition and Dietary Supplements »

The number of Measures in each Domain is shown in parenthesis.


Annual Family Income »
Current Marital Status »
Birthplace »
Ethnicity »
Birthplace of Grandparents »
Health Insurance Coverage »
Birthplace of Parents »
Household Roster-Relationships »
Current Address »
Race »
Current Age »
Self-Reported Gender »
Current Educational Attainment »
Years Living in the U.S. »
Current Employment Status »
Current Employment Status »

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Browse Protocols

Top » Demographics » Health Insurance Coverage

MEASURE: Health Insurance Coverage

Definition: Question asking whether the respondent is covered by health insurance or some other form of health care coverage at the time of the interview.

Purpose: Individuals who don't have health insurance do not visit health care providers on a regular basis or for precautionary testing (e.g., prostate exam) and may be more vulnerable to illness or disease. Usually, individuals who don't have health insurance are those who can't afford to pay the insurance premiums and are not eligible for government programs (e.g., immigrants).

Essential Data: Current Age

Add all protocols from this measure to the cart

Protocols Associated with Measure

Question: Health Insurance »

Description of Protocol

The respondent is asked about health insurance coverage. A number of possible types of health care coverage are included, not simply health insurance.

Specific Instructions

View »

Protocol Text

The next question is about health insurance. Include health insurance obtained through employment or purchased directly as well as government programs like Medicare and Medicaid that provide medical care or help pay medical bills.

Are you covered by health insurance or some other kind of health care plan?

1 [ ] YES
2 [ ] NO
7 [ ] REFUSED
9 [ ] DON'T KNOW

What kind of health insurance or health care coverage do you have? Include those that pay for only one type of service (such as nursing home care, accidents, or dental care). Exclude private plans that only provide extra cash while hospitalized. If you have more than one kind of health insurance, tell me all plans that you have.
[CODE ALL THAT APPLY, HAND CARD WITH LIST OF ANSWERS.
CAPI INSTRUCTION: DO NOT ALLOW MORE THAN ONE ANSWER WHEN 40 (NO COVERAGE OF ANY TYPE) IS CODED.]

14 [ ] PRIVATE HEALTH INSURANCE
15 [ ] MEDICARE
16 [ ] MEDI-GAP
17 [ ] MEDICAID ({IF AVAILABLE, DISPLAY STATE PLAN NAME})
18 [ ] SCHIP (CHIP/CHILDREN'S HEALTH INSURANCE PROGRAM)
19 [ ] MILITARY HEALTH CARE (TRICARE/VA/CHAMP-VA)
20 [ ] INDIAN HEALTH SERVICE

Selection Rationale

The NHANES protocol was vetted against other health insurance coverage measures and was chosen because it determined if the respondent had health insurance and the type of coverage.
Note that the questions do not address the adequacy of health insurance coverage or the cost for co-payments.

Source

National Health and Nutrition Examination Survey (NHANES) Health Insurance Section
2005-2006
Question numbers: HIQ.011 and HIQ.031

National Center for Health Statistics. National Health and Nutrition Examination Survey. NHANES 2005-2006.
http://www.cdc.gov/nchs/about/major/nhanes/nhanes2005-2006/nhanes05_06.htm

Language of Source

English, Spanish

Protocol Life Stage

Adult (18+)
Young Adult (13-17)

Personnel and Training Required

The interviewer must be trained to conduct personal interviews with individuals from the general population. The interviewer must be trained and found to be competent (i.e., tested by an expert) at the completion of personal interviews*. The interviewer should be trained to prompt respondents further if a "don't know" response is provided.

* There are multiple modes to administer this question (e.g., pencil and paper and computer-assisted interviews).

Substance Use Working Group

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Substance Use Measures

- Alcohol – lifetime use
- Alcohol – 30-day quantity and frequency
- Alcohol – maximum drinks in 24-hours
- Alcohol – age of first use
- Tobacco – smoking status
- Tobacco – 30-day quantity and frequency
- Tobacco – age of initiation of use
- Tobacco – age of offset of use
- Alcohol – lifetime dependence and abuse
- Tobacco – nicotine dependence
- Substances – lifetime abuse and dependence
- Substances – lifetime use
- Substances – 30-day frequency
- Substances – age of first use

Ethnicity

Do you consider yourself Hispanic/Latino? [Where did your ancestors come from?]

1 [ ] YES [ask follow-up question]
2 [ ] NO
7 [ ] REFUSED
9 [ ] DON'T KNOW

Please give me the number of the group that represents your Hispanic origin or ancestry. categories.

10 [ ] PUERTO RICAN
12 [ ] DOMINICAN (REPUBLIC)
13 [ ] MEXICAN/MEXICANO
14 [ ] MEXICAN AMERICAN
15 [ ] CHICANO
18 [ ] CUBAN
19 [ ] CUBAN AMERICAN
20 [ ] CENTRAL OR SOUTH AMERICAN
40 [ ] OTHER LATIN AMERICAN
41 [ ] OTHER HISPANIC
77 [ ] REFUSED
99 [ ] DON'T KNOW

Race

What race {do you/[if asked of proxy: does Subject Person]} consider {yourself/
Please select 1 or more of these categories.
HAND CARD DMQ5
SELECT ONE OR MORE CATEGORIES

10 [ ] WHITE
11 [ ] BLACK/AFRICAN AMERICAN
12 [ ] INDIAN (AMERICAN)
13 [ ] ALASKA NATIVE
14 [ ] NATIVE HAWAIIAN
15 [ ] GUAMANIAN
16 [ ] SAMOAN
17 [ ] OTHER PACIFIC ISLANDER (SPECIFY)
18 [ ] ASIAN INDIAN
19 [ ] CHINESE
20 [ ] FILIPINO
21 [ ] JAPANESE
22 [ ] KOREAN
23 [ ] VIETNAMESE
24 [ ] OTHER ASIAN (SPECIFY)
25 [ ] SOME OTHER RACE (SPECIFY)___
77 [ ] REFUSED
99 [ ] DON'T KNOW