The PhenX Toolkit: Phenotype and eXposure measures for collaborative research

Introduction

Carol M. Hamilton, PhenX PI

May 8, 2014
PhenX: consensus measures for Phenotypes and eXposures

- PhenX is funded by the National Institute of Human Genomics (NHGRI), Project Scientist, Dr. Erin Ramos
- NHGRI recognized that including standard measures in genome-wide association studies (GWAS) would have significant impact on biomedical research and released an RFA
- In September 2007, RTI International was awarded a cooperative agreement (U01) to select and define high priority measures for GWAS
- In July 2013, RTI International was awarded a genomics resource grant (U41) to maintain and expand the Toolkit and extend beyond GWAS
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

  – 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.
PhenX Approach

- The approach was to select 15 high-priority measures for each of 21 research domains
  - Domains were selected by the PhenX Steering Committee
  - Measures and protocols were chosen by Working Groups which are assembled for each domain
  - Scientific community had the opportunity to review and comment on initial set of up to 25 measures for each domain
- Measures are made available to the research community via the PhenX Toolkit
- The PhenX Toolkit facilitates broad use of standard measures by the research community, and promotes collaboration
- The PhenX Toolkit is available for use at no cost
PhenX - Building Consensus

- PhenX Steering Committee (SC)
  - Provides guidance to the project
  - Selects domains and define scope

- NIH Institutes and Centers (IC) Liaisons to SC
  - Provide expertise, outreach

- Expert Working Groups assembled for each domain
  - Refine the scope
  - Select specific measures and protocols

- Outreach to Scientific Community
  - Obtain comments for consideration by the Working Groups
### What the PhenX Toolkit Is and Is Not

#### What the PhenX Toolkit is

- a catalog of recommended measures for inclusion in new studies or when expanding existing studies
- a database that allows researchers to browse, search, and select measures
- cross-referenced to Cancer Biomedical Informatics Grid (caBIG) Common Data Elements

#### What the PhenX Toolkit is not

- not a new set of standards
- not a new ontology of phenotypes
- not a data repository
- not a biobank
- not restrictive
- not a proprietary resource
Welcome to the PhenX Toolkit

The Toolkit provides standard measures related to complex diseases, phenotypic traits and environmental exposures. Use of PhenX measures facilitates combining data from a variety of studies, and makes it easy for investigators to expand study design beyond the primary research focus. All Toolkit content is available to the public at no cost.

Information about the project is available at www.phenx.org

Please Read Toolkit Guidance

How to cite use of PhenX measures:

Measures incorporated in this study were selected from the PhenX Toolkit version September 20, 2013, Ver 5.6. More »

How to cite the PhenX Toolkit:


Funding for PhenX and the PhenX Toolkit was provided by NHGRI S00HG004597 and 3U01HG004597-03S3.

PhenX Toolkit Release Notes

Please take a quick survey to tell us how we can improve the Toolkit.

There are a total of 339 measures in the PhenX Toolkit.

<table>
<thead>
<tr>
<th>Top 5 Measures - Release 5.6</th>
<th>Top 5 Domains - Release 5.6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Current Age</td>
<td>1. Demographics</td>
</tr>
<tr>
<td>2. Gender</td>
<td>2. Anthropometrics</td>
</tr>
<tr>
<td>3. Race</td>
<td>3. Alcohol, Tobacco and Other Substances</td>
</tr>
<tr>
<td>4. Ethnicity</td>
<td>4. Cardiovascular</td>
</tr>
<tr>
<td>5. Weight</td>
<td>5. Environmental Exposures</td>
</tr>
</tbody>
</table>

View Top 20 Measures

PhenX Updates: Subscribe / Unsubscribe
PhenX RISING

Catherine A. McCarty
Co-Chair PhenX Steering Committee
May 8, 2014

RTI International is a trade name of Research Triangle Institute
Why Use Standard Measures?

- Study findings require validation
  - Initial findings need to be replicated, standard measures aid comparisons

- Increased sample size provides greater statistical power
  - For GWAS, to identify moderate associations and more complex interactions
  - For other types of studies, increases statistical confidence in results

- Cross-study analyses increase the impact of individual studies
  - Many diseases and conditions share common risk factors
  - Use of standard (common) measures facilitates cross-study analyses
PhenX Definitions

- **DOMAIN**: Topical area with a unifying theme
  Alcohol, Tobacco and Other Substances

- **MEASURE**: A certain characteristic of, or related to, a study subject
  30-Day Quantity and Frequency Protocol

- **PROTOCOL**: Standard procedure recommended by a Working Group to collect and record a PhenX measure
  2 questions from the National Survey on Drug Use and Health
PhenX Domains – Environmental Exposures

- Alcohol, Tobacco, and Other Substances
- Anthropometrics
- Cancer
- Cardiovascular
- Demographics
- Diabetes
- Environmental Exposures
- Gastrointestinal
- Infectious Diseases and Immunity
- Neurology
- Nutrition and Dietary Supplements
- Ocular
- Oral Health
- Physical Activity and Physical Fitness
- Psychiatric
- Psychosocial
- Reproductive Health
- Respiratory
- Skin, Bone, Muscle, and Joint
- Social Environments
- Speech and Hearing
Criteria for Selecting PhenX Measures

- The measures should be:
- Clearly defined
- Well established
- Broadly applicable
- Validated
- Reproducible
- Specific
- Reliable
- Standard measurement protocols exist
PhenX Toolkit

- Researchers will visit the Toolkit to:
  - Add standard measures to ongoing studies
  - Consider PhenX measures when planning new studies
  - Obtain high quality measures outside of their area of expertise
  - Review PhenX measures that relate to their primary research focus

- By selecting some of the PhenX measures:
  - 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
  - Potential to cumulatively combine with future studies
Facilitating Cross-Study Analysis

Select PhenX Measures from the Toolkit

CVD
Diabetes
Obesity
Future Studies

Individual Studies

Combine Study Results

Increased Sample Size + Increased Statistical Power

Detect More Subtle and/or More Complex Gene Associations
PhenX RISING

- NHGRI and the Office of Behavioral and Social Sciences Research (OBSSR) sponsored an Administrative Supplement to add PhenX measures to ongoing studies (for NIH funded projects)

- PhenX RISING, Real World Implementation, and SharING

- 7 ongoing studies, collaborating to expand their studies by adding PhenX measures
<table>
<thead>
<tr>
<th>PI/Institution</th>
<th>Study Name</th>
<th># PhenX Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allison Aiello, Ph.D., University of Michigan</td>
<td>Ecologic Stressors, Post-Traumatic Stress Disorder, and Drug Use in Detroit</td>
<td>12</td>
</tr>
<tr>
<td>Robert Bilder, Ph.D., UCLA</td>
<td>Human Translational Applications Core</td>
<td>19</td>
</tr>
<tr>
<td>Terry Jernigan, Ph.D., UCSD</td>
<td>Creating a Pediatric Imaging-Genomics Data Resource</td>
<td>25</td>
</tr>
<tr>
<td>Catherine McCarty, Ph.D., Essentia Institute of Rural Health</td>
<td>Genome-Wide Study of Cataract and Low HDL in Personalized Medicine Research Project</td>
<td>32</td>
</tr>
<tr>
<td>Dharambir Sanghera, Ph.D., University of Oklahoma</td>
<td>Genome-Wide Association Scan to Identify Risk Genes for Type 2 Diabetes in Asian Indians</td>
<td>4 (bioassays)</td>
</tr>
<tr>
<td>Timothy Strauman, Ph.D., and Ahmad Hariri, Ph.D., Duke University</td>
<td>Self-Regulation Failure: Identifying and Modifying a Risk Phenotype</td>
<td>37</td>
</tr>
<tr>
<td>Yi Zeng, Ph.D., Duke University</td>
<td>Determinants of Healthy Longevity in China</td>
<td>28</td>
</tr>
</tbody>
</table>
PhenX RISING – shared measures

• The 7 groups added a total of 76 PhenX measures to their existing studies.

• These measures included demographics, psychosocial risk factors, psychiatric assessments, and a variety of exposures.

• 55 of the 76 measures were shared by two or more groups, providing common ground for future cross-study analysis.
PhenX Toolkit demonstration

Wayne Huggins
PhenX Co-Investigator

May 8, 2014
PhenX Toolkit Use Statistics (updated April 9, 2014)

- Number of Registered Users: 1,452
- Number of Countries that have Accessed the PhenX Toolkit: 155
- Number of Visits: 537,677
- Number of Unique Visits (March, 2014): 5,825
- Average Visits Per Day: 286
- Report Downloads: 3,872
Resources

- **www.phenxtoolkit.org**
  - Find PhenX measures for inclusion in your study
  - Quick Start guide
  - Tutorial
  - Video and PowerPoint archive
    [link](https://www.phenxtoolkit.org/index.php?pageLink=resources.presentations)

- **www.phenx.org**
  - Provides general information about the PhenX project
  - Register to receive periodic updates via e-mail of the PhenX Newsletter and notification of new surveys

- **www.genome.gov/gwastudies/**
  - A catalog of published Genome-Wide Association Studies
    (Hindorff et al. PNAS 2009)
Acknowledgements

• NHGRI
  – Erin M. Ramos (Project Scientist)
  – Teri Manolio

• PhenX Steering Committee
  – Mary Marazita, Co-Chair
  – Cathy McCarty, Co-Chair

• WG Chairs / Members

• IC Liaisons

• NIDA lead – Kevin Conway
• TRSP lead – Kay Wanke
• NIMH lead – Greg Farber

• Collaborators

• RTI Team
  – Carol M. Hamilton (PI)
  – Tabitha Hendershot (Co-Investigator)
  – Joe Pratt (Project Manager)
  – Darigg Brown
  – Beth Eubanks
  – Wayne Huggins
  – Debbie Maiese
  – Destiney Nettles
  – Helen Pan
  – Mike Phillips
  – Toolkit team
  – Communications team
  – Logistics team
PhenX Toolkit Contents

- Recommended measures for each research domain
- Detailed protocols for collecting the measures
- Information about the measures
  - Rationale for inclusion
  - References
  - Supplemental Information
- User support
  - Quick Start guide
  - Tutorial
  - Glossary of terms
  - Frequently Asked Questions (FAQs)
  - Feedback tool
Toolkit Features

• Search or Browse
  – Browse by domain, collection or measure
  – Search using “Smart Query Tool”

• Add measures to “My Toolkit”
  – Recommends related measures
  – Registration allows users to save and share multiple Toolkits

• Provides information about selected measures
  – Reports, download, review, print or save
  – Custom Data Collection Worksheets (DCW)
  – Data Dictionaries (DD) support data submission to dbGaP
Browse Measures

Browse through Measures to view Protocols.

Browse » Domains »

**DOMAIN:** Psychosocial 180000

- **Release Date:** December 13, 2010
- View scope of domain »
- View Supplemental Information »
- View Working Group Roster »

Add to My Toolkit 180100 Acculturation »

Add to My Toolkit 181300 Chronic Stress »

Add to My Toolkit 180200 Coping Styles »

Add to My Toolkit 181200 Crime and Delinquency »

Add to My Toolkit 180300 Current Quality of Life »

Add to My Toolkit 180400 Disinhibiting Behaviors - Impulsivity »

Add to My Toolkit 180500 Emotional State »

Add to My Toolkit 181400 Exposures to Violence »

Add to My Toolkit 180600 General Self-Efficacy »

Add to My Toolkit 180700 Perceived Social Support/Conflict »

Add to My Toolkit 180800 Perceived Stress »

Add to My Toolkit 180900 Self-esteem »

Add to My Toolkit 181500 Social Capital »

Add to My Toolkit 181000 Social Isolation »

Add to My Toolkit 181100 Temperament »

The numbers in the number format indicate unique codes for each domain, measure and protocol.

« Back To Domains List
**Review Measure**

**Measure:** Temperament - Child Protocol

**Definition:** This is a measure used to assess individual differences in emotional and motor reactivity and the attentional capacities that support self-regulation.

**Purpose:** Temperament includes several dimensions of emotion and reactivity that are part of a person’s personality. Maturation and life experiences change these dimensions as a person ages. These dimensions can be measured via questionnaires and the results may be correlated with changes in personality and behaviors later in life.

**Protocols:**

- Temperament - Child Protocol
- Temperament - Early Childhood Protocol
- Temperament - Infant Protocol
- Temperament - Adolescent

**Essential Measures**

<table>
<thead>
<tr>
<th>Current Age</th>
<th>Related Measures</th>
<th>Collections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personality Traits</td>
<td>Personality Use-related Psychosocial Risk Factors</td>
<td></td>
</tr>
</tbody>
</table>

**Keywords:** activation control, activity level, adolescent, affect, affiliation, aggression, anger/frustration, approach/positive anticipation, attention, attentional focusing, behavior, CBQ, child, Children's Behavior Questionnaire, depressive mood, discomfort, Early Adolescent Temperament Questionnaire, Early Childhood Behavior Questionnaire, EATQ-R, ECBQ, effortful control, extraversion, fear, frustration, high-intensity pleasure, IBQ, impulsivity, infant, Infant Behavior Questionnaire, inhibitory control, negative affect, perceptual sensitivity, personality, pleasure, pleasure sensitivity, proprietary, psychosocial, Rothbart, sadness, shyness, smiling and laughter, soothability, surgency, temperament, Psychosocial

**Measure Release Date:** December 13, 2010

*Adding this measure to My Toolkit will add all protocols associated with this measure (listed below)*
Protocols Overview

Browse » Domains » Psychosocial » Temperament » Temperament - Child Protocol

Note: Some Protocols contain images. You may click the thumbnails to preview the full image. To print Protocols with full-size images, please add those Protocols to your Toolkit and Generate a Report.

**TEMPERAMENT - CHILD PROTOCOL**

<table>
<thead>
<tr>
<th>Jump to section:</th>
<th>Show Summary</th>
</tr>
</thead>
</table>

**Protocol Release Date**

December 13, 2010

**Description of Protocol**

The Children’s Behavior Questionnaire (CBQ) is a parent-report questionnaire used to measure the temperament of a child (3 to 7 years old). The 36-item instrument (very short form) includes questions from the original CBQ to assess three broad factors (surgency/extraversion, negative affectivity, effortful control). Respondents are asked to read each description of behavior and indicate how many times in the past week the child exhibited this behavior. Respondents should circle the frequency on a 7-point Likert scale beginning with extremely untrue of your child (1) and ending with extremely true of your child (7). A “not applicable” response is also available.

**Specific Instructions**

None

**Protocol Text**

The Children’s Behavior Questionnaire (CBQ) may be obtained by completing the request form on Mary Rothbart’s website and sending the form to the contact person indicated. Information about scoring the instrument is also available by request.

**Selection Rationale**

**Source**

**Personnel and Training Required**

**Equipment Needs**

**Standards**

**General References**

**Protocol Type**

**Derived Variables**
TEMPERAMENT - CHILD PROTOCOL *(181101)

Jump to section:
Description of Protocol
Special Instructions
Protocol Text
Protocol Release Date
Selection Rationale
Source
Personnel and Training Required
Equipment Needs
Standards
General References
Protocol Type
Derived Variables
Requirements

Protocol Overview

Browse » Domains » Psychosocial » Temperament » Temperament - Child Protocol

Note: Some Protocols contain images. You may click the thumbnails to preview the full image. To print Protocols with full size images, please add those Protocols to your Toolkit and Generate a Report.

TEMPERAMENT - CHILD PROTOCOL *(181101)

The Children's Behavior Questionnaire (CBQ) is a parent-report questionnaire used to measure the temperament of a child (3 to 7 years old). The 36-item instrument (very short original CBQ) to assess three broad factors (surgency/extraversion, negative affectivity, effortful control). Respondents are asked to read each question (on a 7-point Likert scale beginning (1) and ending with extremely true of your child (7). A "not applicable" response is also available.

Protocol Text

The Children's Behavior Questionnaire (CBQ) may be obtained by completing the request form on Mary Rothbart's website and sending the form to the contact person indicated. Information about scoring the instrument is also available by request.

Selection Rationale

Source


Language of Source

English

Participant from Source

Parent of a child ages 3 - 7 years
Searching the Toolkit

- There is some overlap among the 21 research domains.
- For example, not all mental health related measures are in the Psychiatric domain; not all diabetes related measures are in the Diabetes domain.
- Each WGs reviews measures already in the Toolkit before proceeding; new measures must be complementary to those already in the Toolkit.
- The Search features make it easy for users to find measures of interest from any domain in the Toolkit.
PhenX Smart Query Tool

- **Search with Filters**
  - Filter search results using protocol characteristics (Data Collection Mode, Lifestage, Time to Complete, and Language)

- **Smart Search**
  - Searches through measure names, aliases, and keywords; high specificity

- **Text Search**
  - Searches through full text of measures and protocols; high sensitivity

- **Supplemental Information**
  - Searchable in the full-text search only
**PhenX Toolkit**

**Smart Query Tool**

Enter search term or PhenX ID:

```
"mental health"
```

Show [10] results per page

[Smart Search] [Text Search]

**Search with Filters:** To filter results by the following parameters, please identify desired types of measures by clicking the filter name. The filters are: Data Collection Mode, Lifestage, Time to Complete and Language. If no boxes are checked, then search results will reflect all Toolkit contents.

<table>
<thead>
<tr>
<th>Data Collection Mode</th>
<th>Lifestage</th>
<th>Time to Complete</th>
<th>Language</th>
</tr>
</thead>
</table>

20 search results in terms and synonyms for "mental health", 0 supplemental (0 filtered - view filters):

Search result 1 - 10 of 20 results

<table>
<thead>
<tr>
<th>PhenX Measure</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical, Social, and Mental Health Functioning (SF-36v2®)</td>
<td>This is a measure to assess overall health status and outcomes.</td>
</tr>
<tr>
<td>Current Quality of Life</td>
<td>This is a measure of an individual's perceived general physical and mental health during the past 30 days.</td>
</tr>
<tr>
<td>Sleep Disorders Screener</td>
<td>A questionnaire to assess sleep disorders, a broad group of disorders that can be caused by endogenous disturbances in the sleep-wake or timing cycles (American Psychiatric Association, 2000).</td>
</tr>
<tr>
<td>Posttraumatic Stress Disorder (PTSD)</td>
<td>This is a questionnaire to assess posttraumatic stress disorder (PTSD), an anxiety disorder characterized by reliving a terrifying event- such as violent personal assaults, natural or human-caused disasters, accidents, or military combat - and avoiding associated situations (American Psychiatric Association, 2000).</td>
</tr>
<tr>
<td>Anxiety Disorders Screener</td>
<td>A questionnaire to assess anxiety disorders, which includes a number of different conditions such as panic disorder, generalized anxiety disorder, social phobia, specific phobia, agoraphobia, obsessive compulsive disorder, and posttraumatic stress disorder (American Psychiatric Association, 2000).</td>
</tr>
</tbody>
</table>
Statistics-Based Recommendations

Users who chose this measure also chose:
- Current Quality of Life (Psychosocial)
- Crime and Delinquency (Psychosocial)
- Perceived Social Support/Conflict (Psychosocial)
- General Self-Efficacy (Psychosocial)
- Self-esteem (Psychosocial)
Core Collection

- View SAA Scientific Panel Roster
  - Core: Tier 1
  - Core: Tier 2

Specialty Collections

- SAA Working Group 1: Substance Use - View Roster
  - Assessment of Substance Use and Substance Use Disorders
  - Substance-specific Intermediate Phenotypes

- SAA Working Group 2: Risk Factors - View Roster
  - Substance Use-related Neurobehavioral and Cognitive Risk Factors
  - Substance Use-related Psychosocial Risk Factors

- SAA Working Group 3: Community, Comorbidities, and Outcomes - View Roster
  - Substance Use-related Community Factors
  - Substance Use-related Co-morbidities and Health-related Outcomes
Register Your Study Feature

- Includes study descriptions and lists PhenX protocols used
- Helps PhenX Registered Users find other studies that are using the same PhenX protocols and to identify opportunities for cross-study analysis
### Registered Studies

**Back to Registered Studies**

**View All Studies - by PhenX protocol**

#### Show 10 entries

<table>
<thead>
<tr>
<th>Study Name</th>
<th>Principal Investigator</th>
<th>Research Focus</th>
<th>Primary Contact Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese Longitudinal Healthy Longevity Survey</td>
<td>Yi Zeng, PhD</td>
<td>The goal of this study is to search for a better understanding of the effects of the determinants of healthy longevity. In the 2011-2012 wave of survey, 13 PhenX measures were applied in our CLHLS data collection, which were adapted to the context of Chinese culture and language.</td>
<td>Huashuai Chen, Ph.D</td>
</tr>
<tr>
<td>Duke University Imaging and Genetics</td>
<td>Timothy Strauman, PhD,</td>
<td>The study was designed to validate a hypothesized gene/environment/self-regulation risk phenotype (a combination of individual differences in regulatory focus, COMT genotype, and chronic failure to attain a particular kind of personal goal) that is believed to confer vulnerability to failures of self-regulation, which in turn increase risk for psychopathology with significant public health implications such as aggression, gambling, and excessive use of alcohol and other drugs.</td>
<td>Spenser Jacobson</td>
</tr>
<tr>
<td>Pediatric Imaging Neurocognition and Genetics</td>
<td>Terry Jernigan, PhD</td>
<td>Pediatric Imaging, Neurocognition, and Genetics (PING) is a multi-site cross-sectional study of typically developing children, adolescents, and young adults ranging in age from 3 to 20. The primary goal of PING is to create a pediatric imaging-genomics database of approximately 1400 cases that is freely available to the scientific community.</td>
<td>-</td>
</tr>
<tr>
<td>UCLA Consortium for Neuropsychiatric Phenomics</td>
<td>Robert Bilder, PhD</td>
<td>The Consortium for Neuropsychiatric Phenomics comprises 8 linked grants awarded under the aegis of the NIH Roadmap Initiative. The PhenX supplement grant was awarded to the Human Translational Applications Core, a center core that conducted extensive phenotyping of more than 1000 healthy volunteers aged 21 to 50 in the Los Angeles metropolitan area from 2007 to 2012. The phenotyping efforts focused on two primary themes - memory mechanisms and response inhibition mechanisms - and participants completed approximately 12 hours of cognitive phenotyping, and a subset of these participants received also several hours of neuroimaging procedures to examine brain structure and function (descriptions of these procedures are available at <a href="http://www.phenomics.ucla.edu">www.phenomics.ucla.edu</a>).</td>
<td>-</td>
</tr>
</tbody>
</table>
Data Sharing and Data Interoperability

• National Library of Medicine (NLM)
  – National Center for Biotechnology Information (NCBI) database of Genotypes and Phenotypes dbGaP
  – Logical Observation Identifiers Names and Codes (LOINC)
  – Unified Medical Language System (UMLS)
• National Cancer Institute (NCI)
  – Cancer Data Standards Registry and Repository (caDSR) Common Data Element (CDE)
  – Grid Enabled Measures (GEM)
• National Center for Biological Ontologies (NCBO) BioPortal
  – NCBO mapped PhenX to BioPortal ontologies using Lexical OWL Ontology Matcher (LOOM)
PhenX and Existing Standards

- dbGaP: GENOTYPES and PHENOTYPES
- CDE Browser
- Unified Medical Language System® (UMLS®)
- PHIN Vocabulary Access and Distribution System (VADS)
- LOINC®: Logical Observation Identifiers Names and Codes
- BioPortal
### Cross-reference table for PhenX measures and variables

<table>
<thead>
<tr>
<th>PhenX variable</th>
<th>PhenX ID</th>
<th>dbGaP variable</th>
<th>LOINC code</th>
<th>P3G variable*</th>
<th>eMERGE variable</th>
<th>caDSR CDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Age</td>
<td>PXV010101020000</td>
<td>phv00023938.v1, phv00024004.v1</td>
<td>21612-7</td>
<td>Age</td>
<td>Age</td>
<td>2423393</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>PXV010501010000</td>
<td>phv00023941.v1, phv00024007.v1</td>
<td>56050-8</td>
<td>Ethnicity</td>
<td>Ethnicity</td>
<td>2200284</td>
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<tr>
<td>Gender</td>
<td>PXV010701010000</td>
<td>phv00023939.v1, phv00024005.v1</td>
<td>46607-8</td>
<td>Gender</td>
<td>Gender</td>
<td>2179640</td>
</tr>
</tbody>
</table>

* P3G DataShaPER doesn't distinguish between “exact” and “similar” mappings to PhenX measures

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*RTI International is a trade name of Research Triangle Institute*