Add Health
The National Longitudinal Study of Adolescent to Adult Health

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Home Exam Health & Quality Control Metrics

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This user guide is new at Wave VI. It briefly describes several health and quality control metrics from the Wave VI home exam questionnaire and biomarker collection that are not described elsewhere but may be valuable to researchers. It is one in a larger set of Wave VI user guides describing protocols for:

- Anthropometrics
- Baroreflex Sensitivity
- Biomarker Weights
- Cardiovascular Measures
- Glucose Homeostasis
- Hepatic Injury
- Home Exam – Medication use
- Infection
- Inflammation and Immune Function
- Lipids
- Neurodegeneration
- Renal Function

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1. Introduction

During the Wave VI home exam, field examiners collected data using a 7" Samsung tablet and the Add Health Open Data Kit (ODK) application. ODK questionnaire data relevant to the subject matter of other Wave VI user guides are logically included in them. For example, arm circumference is included in the Cardiovascular Measures user guide because it was used to guide selection of an appropriately sized blood pressure cuff. However, several health and quality control metrics from the Wave VI home exam questionnaire and biomarker collection that are not available in other user guides also may be useful to investigators. They are therefore included herein and briefly summarized below.

2. Health Metrics

ODK questionnaire data that may be useful to researchers but are not described elsewhere stem from participants' answers to questions about current pregnancy, general health, diet, recent travel, prior mastectomy, fainting, and bleeding (**Figure 1**). Some of the questions are similar to those in the Add Health Wave VI survey.

Variable	ODK Question	Possible Values
H6BQ01	Are you pregnant?	No, Yes, Question Not Asked¥, Legitimate Skip‡, Don't Know§
H6BQ02	In general, how is your health?	Poor, Fair, Good, Very Good, Excellent, Refused*
H6VEG to H6DIABET	Which of these diets†, if any, are you currently following?	No, Yes, Refused*
H6BQ07	Have you travelled outside the United States?	In the Past Month, 3 Months, 6 Months, 12 months, Not in the Past Year, Refused*
H6CQ03	Have you had a mastectomy?	No, Yes, Refused*, Legitimate Skip‡
H6CQ04	If you have had a mastectomy, on which side was the mastectomy performed?	Left, Right, Double, Refused*, Legitimate Skip‡
H6GQ05	Have you had any problems in the past with fainting during a blood draw?	No, Yes, Refused*, Legitimate Skip‡

H6GQ06	Have you had any problems in the past with bleeding or taking anticoagulants?	No, Yes, Refused*, Legitimate Skip‡

¥Question Not Asked = -9995. *Refused = -9996. †Vegetarian, Vegan, Raw Food, Low Fat/Low Cholesterol, Low Salt/Low Sodium, Low Fiber, High Fiber, Low Carbohydrate, Gluten-Free or Celiac, Lactose-Free, Renal or Kidney, or Diabetic. ‡Legitimate Skip = -9997. §Don't Know = -9998.

Figure 1. **Variables, ODK Questions, and Possible Values**

3. Quality Control Metrics

Several quality control metrics also were collected or calculated throughout Wave VI. They originate in the ODK questionnaire, FedEx shipping logs, and Laboratory for Clinical Biochemistry Research (LCBR) reports from the University of Vermont, where all blood collected at Wave VI was shipped, assayed, and archived. Add Health users may wish to examine the metrics reported below to best understand the quality of the home exam data.

3.1 Home Exam Blood Collection, Processing, and Shipment

To minimize biomarker degradation and maximize both the reliability and validity of all blood-based biomarker assays, field examiners preferentially scheduled home exams on Monday through Thursday mornings or early afternoons. Doing that allowed blood to be collected, packaged, and shipped to LCBR on the same day so that it could arrive at LCBR by 10:30 a.m. the next morning. Otherwise, blood collected in the late afternoon, evening, or on weekends was chilled and held by field examiners until it was shipped, usually the next day to ensure that it would still be cold on arrival at LCBR ≤ 48 hours after collection.

To prevent blood arriving warm or > 48 hours after collection, Add Health monitored exam days of the week, exam start times, exam durations, and all intervals between blood collection, centrifugation, FedEx shipment, LCBR receipt, and assay (**Figures 2-6**). Add Health used this information during the data collection process to improve field examiner protocol and to tailor quality control interventions. The information also allows Add Health users to examine potential sources of technical, circadian, and/or seasonal variation in biomarkers.

On average, the home exams lasted 41 minutes. The most frequent exam day was Monday, and the most frequent start time was 9:00 a.m. That said, the exam days and times varied quite extensively during Wave VI (**Figures 3-4**).

Variable	Quality Control Metric	Unit
H6EXAMDOW	Exam Day of Week	Mon-Sun
H6EXAMHR	Exam Start Time – Hour of Day	hh:mm
H6EXAMDUR	Exam Duration	minutes
H6BLOODBEG	Exam Start-Blood Collect Interval	minutes
H6BLOODCEN	Blood Collect-Centrifuge Interval	hours
H6CENSEND	Centrifuge-FedEx Ship Interval	hours
H6SENDREC	FedEx Ship-LCBR Receive Interval	hours
H6CENREC	Centrifuge-LCBR Receive Interval	hours
H6BLOODREC	Blood Collect-LCBR Receive Interval	hours
See Figure 6	LCBR Receive to Assay Interval	days

Figure 2. Quality Control Metrics

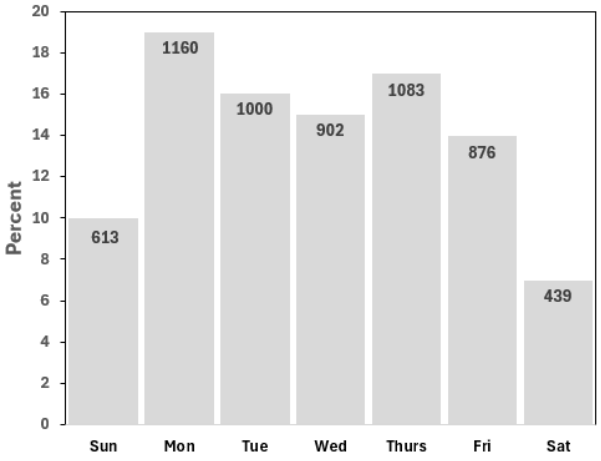

Figure 3. Exam Day of Week

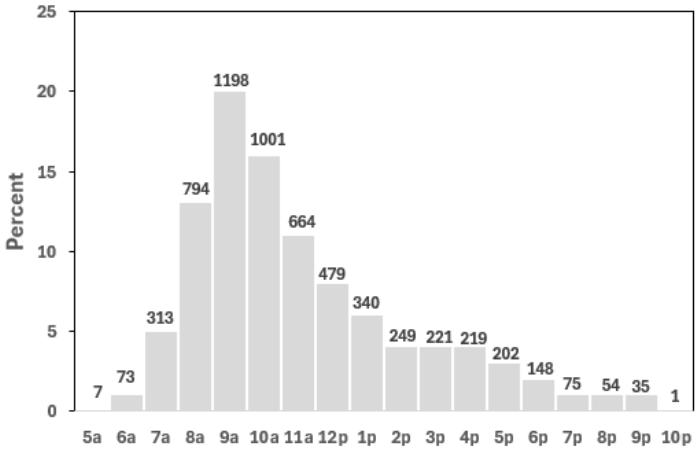

Figure 4. Exam Start Time

Variable	Quality Control Metric	n	Mean (SD)	Median
H6EXAMHR	Hour of day home exam began*	6073	11.0 (4.1)	10.3
H6EXAMDUR	Exam Duration (min)	6073	41.2 (15.1)	39.0
H6BLOODBEG	Exam Start-Blood Collect Interval (min)	5637	32.2 (22.3)	30.0
H6BLOODCEN	Blood Collect-Centrifuge Interval (hr)	5513	0.7 (0.5)	0.6
H6CENSEND	Centrifuge-FedEx Ship Interval (hr)	5374	13.1 (15.7)	5.6
H6SENDREC	FedEx Ship-LCBR Receive Interval (hr)	5406	20.0 (9.7)	17.6
H6CENREC	Centrifuge-LCBR Receive Interval (hr)	5491	34.0 (18.3)	24.4
H6BLOODREC	Blood Collect-LCBR Receive Interval (hr)	5491	34.7(18.3)	25.0

*Statistics for hour of day were properly computed accounting for its circular distribution and therefore differ from the corresponding arithmetic mean and standard deviation (SD) in the codebook.[1]

Figure 5. Quality Control Metric Summary Statistics

Variable	LCBR Receive to Assay Interval (days)	n	Mean (SD)	Median
H6RECCLIN	All clinical assays except HbA1c*	5511	0.5 (0.8)	0.0
H6RECHBA1C	HbA1c	5511	0.5 (0.9)	0.0
H6RECCMV	CMV IgG	5373	336.7 (169.8)	261.0
H6RECCRP	hsCRP	5384	195.5 (92.0)	176.0
H6RECCYTO	Cytokines†	5372	211.1 (123.0)	176.0
H6RECHSV	HSV IgG	5496	396.4 (133.1)	376.0
H6RECNEURO	Neurodegeneration Biomarkers‡	5337	198.7 (93.8)	193.0
H6RECCOV	SARS-CoV-2 IgGs	2160	96.0 (62.5)	90.0

*Glucose, total cholesterol, high- and low-density lipoprotein cholesterol, triglycerides, aspartate aminotransferase, alanine aminotransferase, and creatinine. †Interleukins 1β, 6, 8, and 10; and tumor necrosis factor - alpha. ‡Neurofilament light, total tau, and glial fibrillary acidic protein. CMV = cytomegalovirus. HbA1c = hemoglobin A1c. hsCRP = high sensitivity C-reactive protein. HSV = herpes simplex virus. IgG = immunoglobulin G. SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2 spike, nucleocapsid, and receptor binding domain.

Figure 6. LCBR Receive to Assay Interval Summary Statistics

3.2 Plasma and Serum Tube Conditions

To assess quality of venous blood samples, Add Health also monitored plasma and serum tube conditions on arrival at LCBR (**Figure 7**). The temperature of and presence of hemolysis in all serum and plasma tubes were determined and recorded separately. Only 239 (4%) of 5,511 serum tubes and 234 (4%) of 5,511 plasma tubes were identified as warm. Only 181 (3%) and 239 (4%) were identified as extremely hemolyzed, respectively. Those identified as warm or extremely hemolyzed were not assayed.

Those that arrived more than 48 hours after collection, but were still cold, and others that arrived only slightly hemolyzed were still assayed.

Variable	ODK Question	Possible Values
H6BTUBECON	Plasma tube condition	*
H6STUBECON	Serum tube condition	*
*Normal, Hemolyzed, Clotted, Tube Broken, Incorrect Sample Type, Frozen, Room Temperature, Incorrect or Missing B6ID Label, Tube Missing, Not Applicable or Missing.		

Figure 7. Plasma and Serum Tube Conditions

4. Quality Control Metrics Data File (bqc6.sas7bdat)

4.1 Structure

The structure of the disseminated data file is flat. This means that it is a participant-level data file, where each participant has one and only one record. The participant's identifying number (the AID variable) appears in the data file only once.

4.2 Contents

The quality control data file includes the variables below, which are described in the corresponding codebook documentation that also contains frequencies.

Variable Name	Variable Description
AID	Participant Identifier
H6BQ01	BQ01 Are you currently pregnant
H6BQ02	BQ02 Overall health status
H6EPQ16	EQ16 Where is the home exam being conducted
H6VEG	BQ05A Currently following vegetarian diet
H6VEGAN	BQ05B Currently following vegan diet
H6RAW	BQ05C Currently following raw food diet
H6LOFAT	BQ05D Currently following low fat or low cholesterol diet
H6LOSALT	BQ05E Currently following low salt or low sodium diet
H6LOFIB	BQ05F Currently following low fiber diet
H6HIFIB	BQ05G Currently following high fiber diet
H6LOCARB	BQ05H Currently following low carbohydrate diet
H6GLUTFR	BQ05I Currently following gluten-free or celiac diet
H6LACTFR	BQ05J Currently following lactose-free diet

H6KIDNEY	BQ05K Currently following kidney or renal diet
H6DIABET	BQ05L Currently following diabetic diet
H6ALTBP	Alternate blood pressure unit used
H6BQ07	BQ07 Have you traveled outside the USA
H6CQ03	CQ03 Have you had a mastectomy
H6CQ04	CQ04 Which side was mastectomy performed
H6GQ05	GQ05 Problems in past with fainting from blood draw
H6GQ06	GQ06 Problems in past with bleeding or anticoagulants
H6EXAMDOW	Day of the week of home exam
H6EXAMHR	Hour of day home exam began
H6EXAMDUR	Duration (min) of home exam
H6BLOODBEG	Duration (min) from exam start to blood draw
H6BLOODCEN	Duration (hr) from blood draw to centrifuge
H6CENSEND	Duration (hr) from centrifuge to sent to lab
H6SENDREC	Duration (hr) from sent to lab to received at lab
H6CENREC	Duration (hr) from centrifuge to received at lab
H6BLOODREC	Duration (hr) from blood draw to received at lab
H6RECCLIN	Duration (days) from received at lab to assay performed - Clinical
H6RECHBA1C	Duration (days) from received at lab to assay performed - HbA1c
H6RECCMV	Duration (days) from received at lab to assay performed - CMV
H6RECCRP	Duration (days) from received at lab to assay performed - CRP
H6RECCYTO	Duration (days) from received at lab to assay performed - Cytokines
H6RECHSV	Duration (days) from received at lab to assay performed - HSV
H6RECNEURO	Duration (days) from received at lab to assay performed – Neuro
H6RECCOV	Duration (days) from received at lab to assay performed – COVID-19
H6BTUBECON	Condition of plasma tube used to perform assays
H6STUBECON	Condition of serum tube used to perform assays

5. References

1. Bishop K, Lund UJ. A collection of SAS macros for circular statistics (2006). https://web.archive.org/web/20200628040440/https://statweb.calpoly.edu/ulund/circSASv1.txt.