Documentation, Codebook, and Frequencies

Laboratory Component:
Vitamin A, E and Carotenoids

Survey Years:
2003 to 2004

SAS Export File:
L45VIT_C.XPT

nhanes

NHANES 2003–2004 Data Documentation

Laboratory Assessment: Lab 45 – Vitamin A (retinol, retinyl palmitate, retinyl stearate), **Vitamin E** (α-tocopherol, δ-tocopherol, γ-tocopherol)**, Carotenoids** (lutein, zeaxanthin, α-cryptoxanthin, β-cryptoxanthin, trans-lycopene, cis-lycopene, α-carotene, trans-β-carotene, cis-β-carotene; phytoene and phytofluene)

First Published: October 2007   **Last Revised:** N/A

This file is updated to add vitamins A, E, and Carotenoids data and regression analysis comparing data from 2001-2002 to 2003-2004.

Component Description

The objectives of this component are: 1) to provide data for monitoring secular trends in measures of nutritional status in the U.S. population; 2) to evaluate the effect of people's habits and behaviors such as physical activity and the use of alcohol, tobacco, and dietary supplements on people's nutritional status; and 3) to evaluate the effect of changes in nutrition and public health policies including welfare reform legislation, food fortification policy, and child nutrition programs on the nutritional status of the U.S. population. These data will be used to estimate deficiencies and toxicities of specific nutrients in the population and subgroups, to provide population reference data, and to estimate the contribution of diet, supplements, and other factors to serum levels of nutrients. Data will be used for research to further define nutrient requirements as well as optimal levels for disease prevention and health promotion.

Eligible Sample

Participants aged 6 years and older who do not meet any of the exclusion criteria are eligible.

Description of Laboratory Methodology

Vitamin A, Vitamin E, and Carotenoids

Serum concentrations of vitamin A (retinol, retinyl palmitate, retinyl stearate), vitamin E (α-, δ-, and γ-tocopherols), and twelve carotenoids (lutein, zeaxanthin, α-cryptoxanthin, β-cryptoxanthin, *trans*-lycopene, cis-lycopene, α-carotene, trans-β-carotene, *cis*-β-carotene, *cis*-combined lutein/zeaxanthin,phytoene and phytofluene) are measured using high performance liquid chromatography with multiwavelength photodiode-array absorbance detection. A small volume (150 μL) of serum/plasma is mixed with an equal volume of buffer, and then mixed with 2 volumes of ethanol containing the internal standard (tocol). The analytes are extracted from the aqueous phase into hexane. The combined hexane extracts are dried under vacuum. The extract is

redissolved in ethyl acetate and diluted in mobile phase. An aliquot is injected onto a C18 reversed phase column and eluted isocratically. The analytes all possess absorbance and/or fluorescence which are proportional to their concentration in solution; therefore these properties are used for quantitative analysis. The mode of detection is chosen to provide the highest sensitivity and selectivity. Carotenoids are measured by absorbance at 450 nm. Retinol, retinyl esters, phytoene and phytofluene are measured by UV absorbance near their absorption maxima of 325 nm, 280 nm and 340 nm. Tocopherols have absorption maxima between 292 and 300 nm. Chromatograms are recorded using a computer data system. Analytes are quantified by external standard quantitation using standards to calculate response factors based on the peak area of the analyte. The quantities of analytes are corrected for recovery post-run based upon tocol as an internal standard.

Laboratory testing changed from 2001-2002 and 2003-2004. The National Center for Environmental Health, Centers for Disease & Prevention performed the testing in 2001-2002. Craft Technologies performed the testing in 2003-2004. Craft Technologies measured more analytes in 2003-2004 than the National Center for Environmental Health, Centers for Disease & Prevention measured in 2001-2002. See the codebooks on the NHANES website for the different tests between the two laboratories.

The age group in which these measurements were made changed from 2001-2002 to 2003-2004. Serum concentrations of vitamin A, vitamin E and carotenoids were tested on participants 3 years and older in 2001-2002 and on participants 6 years and older in 2003-2004.

The variable names and/or label descriptors changed from 2001-2002 to 2003-2004 for vitamin E and lutein/zeaxanthin. Also, additional analytes were tested in 2003-2004. The following pairs of test names or codes are used synonymously; vitamin E and α-tocopherol; and vitamin A and retinol. The variable names for vitamin E/α-tocopherol changed from LBXVIE/LBDVIESI in 2001-2002 to LBXATC/LBDATCSI in 2003-2004.

The variable name and label descriptor for lutein (LBXLUT/LBXLUTSI) in the 2002 and earlier data is equivalent to the variable name "combined lutein/zeaxanthin" (LBXLUZ/LBXLUZSI) in the 2003-2004 data. This is because the lutein peak in the CDC method included both lutein and zeaxanthin.

Serum concentrations of α-cryptoxanthin (LBXACY/LBDACYSI), δ-tocopherol (LBXDTC/LBDDTCSI), cis-lycopene (LBXCLC/LBDCLCSI), total lycopene (LBXLCC/LBDLCCSI), lutein (LBXLUT/LBDLUTSI), phytofluene (LBXPHF/LBDPHFSI), phytoene (LBXPHE/LBDPHESI), and zeaxanthin (LBXZEA/LBDZEASI) were measured in 2003-2004, but not in 2001-2002.

A detailed description of the laboratory method used can be found on the NHANES website.

Laboratory Quality Control and Monitoring

The NHANES quality assurance and quality control (QA/QC) protocols meet the 1988 Clinical Laboratory Improvement Act mandates. Detailed QA/QC instructions are discussed in the NHANES Laboratory/Medical Technologists Procedures Manual (LPM). Read the LABDOC file for detailed QA/QC protocols.

A detailed description of the quality assurance and quality control procedures can be found on the NHANES website.

Data Processing and Editing

Data Processing and Editing Serum specimens were processed, stored, and shipped to CTI in Wilson, NC for analysis.

Detailed specimen collection and processing instructions are discussed in the NHANES LPM. Vials were stored under appropriate frozen (–20°C) conditions until they were shipped to CTI.

Twenty-one derived variables were created in this data file. The formula for its derivatization is as follows:

The α-tocopherol (Vitamin E) results in ug/dL were converted into umol/L by multiplying by 0.02322.

The α-carotene results in ug/dL were converted into umol/L by multiplying by 0.01863 .

The α-cryptoxanthin results in ug/dL were converted into umol/L by multiplying by 0.01810.

The trans-β-carotene results in ug/dL were converted into umol/L by multiplying by 0.01863.

The total β-carotene results in ug/dL were converted into umol/L by multiplying by 0.01863 .

The cis-β carotene results in ug/dL were converted into umol/L by

multiplying by 0.01863 .

The cis-lycopene results in ug/dL were converted into umol/L by multiplying by 0.01863.

The cis-lutein/zeaxanthin results in ug/dL were converted into umol/L by multiplying by 0.01758.

The β-cryptoxanthin results in ug/dL were converted into umol/L by multiplying by 0.01810.

The δ-tocopherol results in ug/dL were converted into umol/L by multiplying by 0.02485

The γ-tocopherol results in ug/dL were converted into umol/L by multiplying by 0.02402

The total lycopene results in ug/dL were converted into umol/L by multiplying by 0.01863

The lutein results in ug/dL were converted into umol/L by multiplying by 0.01758.

The combined lutein/zeaxanthin results in ug/dL were converted into umol/L by multiplying by 0.01758.

The trans-lycopene results in ug/dL were converted into umol/L by multiplying by 0.01863.

The phytofluene results in ug/dL were converted into umol/L by multiplying by 0.01843.

The phytoene results in ug/dL were converted into umol/L by multiplying by 0.01837.

The retinyl palmitate results in ug/dL were converted into umol/L by multiplying by 0.03491.

The retinyl stearate results in ug/dL were converted into umol/L by multiplying by 0.03491.

The vitamin A (retinol) results in ug/dL were converted into umol/L by multiplying by 0.03491.

The zeaxanthin results in ug/dL were converted into umol/L by multiplying by 0.01758.

Detailed instructions on specimen collection and processing can be found on the NHANES website.

Analytic Notes

The analysis of NHANES 2003–2004 laboratory data must be conducted with the key survey design and basic demographic variables. The NHANES 2003–2004 Household Questionnaire Data Files contain demographic data, health indicators, and other related information collected during household interviews. The Household Questionnaire Data Files also contain all survey design variables and sample weights required to analyze these data. The Phlebotomy Examination file includes auxiliary information on duration of fasting, the time of day of the venipuncture, and the conditions precluding venipuncture. The Household Questionnaire and Phlebotomy Exam files may be linked to the laboratory data file using the unique survey participant identifier SEQN.

Regression Analysis for 2001-2002 and 2003-2004 for Vitamins A, E, and Carotenoids:

In 2001-2002, Vitamins A, E and Carotenoids were analyzed using a HPLC method performed at CDC/NCEH [See Lab 6 in NHANES 2001-2002 for method details]. In 2003-2004, Vitamins A, E and Carotenoids were analyzed using a comparable HPLC method at Craft Technologies, Inc. (CTI). Crossover studies between CDC/NCEH and CTI were done in early 2003 and late 2004 and differences existed between the methods for some analytes. The following Deming regression analyses were performed to compare data from 2001-2002 to 2003-2004:

Early 2003 Deming Regression Analysis for A/E/Carotenoids Y(CDC)=X(CTI) in ug/dL :			
Test	n	Y(CDC) = X (CTI)	r^2
Alpha-Carotene	100	y = 0.9734x + 0.1847	0.9944
Trans-Beta-Carotene	100	y = 1.0764x – 0.0248	0.9971
Cis-Beta-Carotene	100	y = 0.8017x – 0.0372	0.9685
Beta-Cryptoxanthin	100	y = 1.1359x – 0.2116	0.9945
Gamma-Tocopherol	100	y = 1.0346x – 8.5749	0.9818
Lutein/Zeaxanthin	99	y = 0.9321x + 0.1231	0.9455
Trans-Lycopene	100	y = 1.0719x – 0.1817	0.9947
Retinyl Palmitate	100	y = 1.0245x + 0.5039	0.1988
Retinyl Stearate	97	y = 0.803x – 0.0048	0.9807
Vitamin A	100	y = 0.9406x – 0.1199	0.9887
Vitamin E	100	y = 0.9541x – 22.231	0.9941

Late 2004 Deming Regression Analysis for A/E/Carotenoids Y(CDC)=X(CTI) in ug/dL:

Test	n	Y(CDC) = X (CTI)	r^2
Alpha-Carotene	99	y = 0.9989x + 0.2204	0.9768
Trans-Beta-Carotene	98	y = 1.0275x + 1.2976	0.9960
Cis-Beta-Carotene	99	y = 0.7154x + 0.1344	0.9826
Beta-Cryptoxanthin	98	y = 1.0824x - 0.056	0.9696
Gamma-Tocopherol	98	y = 1.0306x - 5.523	0.9922
Lutein/Zeaxanthin	99	y = 1.1082x - 1.602	0.9141
Trans-Lycopene	98	y = 1.0971x + 0.0645	0.9737
Retinyl Palmitate	98	y = 0.7989x + 1.2106	0.8845
Retinyl Stearate	98	y = 0.7681x + 0.1483	0.9621
Vitamin A	99	y = 0.9806x + 0.2901	0.9934
Vitamin E	98	y = 0.93x + 22.614	0.9905

Combined Deming Regression Analysis for A/E/Carotenoids Y(CDC)=X(CTI) in ug/dL

Test	n	Y(CDC) = X (CTI)	r^2
Alpha-Carotene	199	y = 0.9837x + 0.2137	0.9877
Trans-Beta-Carotene	198	y = 1.0339x + 0.8812	0.9960
Cis-Beta-Carotene	199	y = 0.7232x + 0.0879	0.9815
Beta-Cryptoxanthin	198	y = 1.0958x - 0.0542	0.9793
Gamma-Tocopherol	198	y = 1.029x - 6.287	0.9893
Lutein/Zeaxanthin	198	y = 1.0641x - 1.2402	0.9225
Trans-Lycopene	198	y = 1.0852x - 0.0681	0.9849
Retinyl Palmitate	198	y = 0.8227x + 0.99	0.7603
Retinyl Stearate	195	y = 0.7881x + 0.0711	0.9675
Vitamin A	199	y = 0.9805x - 1.0069	0.9871
Vitamin E	198	y = 0.9397x + 1.649	0.9914

The combined regression was performed using crossover data from early 2003 and late 2004. The data user may wish to apply regression formulas to compare results from 2001-2002 and 2003-2004.

References   N/A

Locator Fields

Title: Serum concentrations of Vitamin A, E and Carotenoids

Contact Number: 1-866-441-NCHS

Years of Content: 2003–2004

First Published: October 2007

Revised: N/A

Access Constraints: None

Use Constraints: None

Geographic Coverage: National

Subject: fat-soluble micronutrients

Record Source: NHANES 2003–2004

Survey Methodology: NHANES 2003–2004 is a stratified multistage probability sample of the civilian non-institutionalized population of the U.S.

Medium: NHANES Web site; SAS transport files

National Health and Nutrition Examination Survey
Codebook for Data Production (2003-2004)

Vitamin A, E and Carotenoids (L45VIT_C)
Person Level Data

First Published: October 2007
Last Revised: N/A

SEQN	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Respondent sequence number

English Text: Respondent sequence number.

English Instructions:

LBXATC	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	a-Tocopherol(ug/dL)

English Text: a-Tocopherol(ug/dL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
39 to 7939	Range of Values	7266	7266	
7	Fill Value of Limit of Detection	2	7268	
.	Missing	714	7982	

LBDATCSI	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	a-Tocopherol(umol/L)			
English Text: a-Tocopherol(umol/L)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.9056 to 184.3436	Range of Values	7266	7266	
0.1625	Fill Value of Limit of Detection	2	7268	
.	Missing	714	7982	

LBXALC	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	a-Carotene(ug/dL)			
English Text: a-Carotene(ug/dL)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.31 to 123.35	Range of Values	7198	7198	
0.21	Fill Value of Limit of Detection	70	7268	
.	Missing	714	7982	

LBDALCSI	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	a-Carotene(umol/L)			
English Text: a-Carotene(umol/L)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.0058 to 2.298	Range of Values	7198	7198	
0.0039	Fill Value of Limit of Detection	70	7268	
.	Missing	714	7982	

LBXACY	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	a-Cryptoxanthin(ug/dL)			
English Text: a-Cryptoxanthin(ug/dL)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.22 to 14.21	Range of Values	7250	7250	
0.14	Fill Value of Limit of Detection	18	7268	
.	Missing	714	7982	

LBDACYSI	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	a-Cryptoxanthin(umol/L)

English Text: a-Cryptoxanthin(umol/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.004 to 0.2572	Range of Values	7250	7250	
0.0025	Fill Value of Limit of Detection	18	7268	
.	Missing	714	7982	

LBXBEC	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	trans-b-carotene(ug/dL)

English Text: trans-b-carotene(ug/dL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.43 to 388.19	Range of Values	7268	7268	
.	Missing	714	7982	

LBDBECSI	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	trans-b-carotene(umol/L)

English Text: trans-b-carotene(umol/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.008 to 7.232	Range of Values	7268	7268	
.	Missing	714	7982	

LBXBCC	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	total b-Carotene(ug/dL)

English Text: total b-Carotene(ug/dL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.43 to 411.48	Range of Values	7268	7268	
.	Missing	714	7982	

LBDBCCSI	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	total b-Carotene(umol/L)

English Text: total b-Carotene(umol/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.008 to 7.6659	Range of Values	7268	7268	
.	Missing	714	7982	

LBXCBC	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	cis-b-carotene(ug/dL)

English Text: cis-b-carotene(ug/dL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.3 to 23.28	Range of Values	6870	6870	
0.21	Fill Value of Limit of Detection	398	7268	
.	Missing	714	7982	

LBDCBCSI		Target		
		B(6 Yrs. to 150 Yrs.)		
Hard Edits		**SAS Label**		
		cis-b-carotene(umol/L)		
English Text: cis-b-carotene(umol/L)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.0056 to 0.4337	Range of Values	6870	6870	
0.0039	Fill Value of Limit of Detection	398	7268	
.	Missing	714	7982	

LBXCLC		Target		
		B(6 Yrs. to 150 Yrs.)		
Hard Edits		**SAS Label**		
		cis-Lycopene(ug/dL)		
English Text: cis-Lycopene(ug/dL)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.4 to 93.63	Range of Values	7265	7265	
0.21	Fill Value of Limit of Detection	3	7268	
.	Missing	714	7982	

LBDCLCSI	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	cis-Lycopene(umol/L)			
English Text: cis-Lycopene(umol/L)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.0075 to 1.7443	Range of Values	7265	7265	
0.0039	Fill Value of Limit of Detection	3	7268	
.	Missing	714	7982	

LBXCLZ	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	cis- Lutein/Zeaxanthin(ug/dL)			
English Text: cis- Lutein/Zeaxanthin(ug/dL)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.23 to 16.28	Range of Values	7262	7262	
0.14	Fill Value of Limit of Detection	6	7268	
.	Missing	714	7982	

LBDCLZSI	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	cis- Lutein/Zeaxanthin(umol/L)

English Text: cis- Lutein/Zeaxanthin(umol/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.004 to 0.2862	Range of Values	7262	7262	
0.0025	Fill Value of Limit of Detection	6	7268	
.	Missing	714	7982	

LBXCRY	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	b-cryptoxanthin(ug/dL)

English Text: b-cryptoxanthin(ug/dL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.49 to 97.1	Range of Values	7252	7252	
0.14	Fill Value of Limit of Detection	16	7268	
.	Missing	714	7982	

LBDCRYSI	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	b-cryptoxanthin(umol/L)

English Text: b-cryptoxanthin(umol/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.0089 to 1.7575	Range of Values	7252	7252	
0.0025	Fill Value of Limit of Detection	16	7268	
.	Missing	714	7982	

LBXDTC	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	d-Tocopherol(ug/dL)

English Text: d-Tocopherol(ug/dL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
3 to 126	Range of Values	5146	5146	
2	Fill Value of Limit of Detection	2122	7268	
.	Missing	714	7982	

LBDDTCSI	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	d-Tocopherol(umol/L)			

English Text: d-Tocopherol(umol/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.0746 to 3.1311	Range of Values	5146	5146	
0.0497	Fill Value of Limit of Detection	2122	7268	
.	Missing	714	7982	

LBXGTC	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	g-tocopherol(ug/dL)			

English Text: g-tocopherol(ug/dL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
15 to 3122	Range of Values	7266	7266	
7	Fill Value of Limit of Detection	2	7268	
.	Missing	714	7982	

LBDGTCSI	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	g-tocopherol(umol/L)			
English Text: g-tocopherol(umol/L)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.3603 to 74.9904	Range of Values	7266	7266	
0.1681	Fill Value of Limit of Detection	2	7268	
.	Missing	714	7982	

LBXLCC	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	total Lycopene(ug/dL)			
English Text: total Lycopene(ug/dL)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.76 to 175.62	Range of Values	7266	7266	
0.21	Fill Value of Limit of Detection	2	7268	
.	Missing	714	7982	

LBDLCCSI	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	total Lycopene(umol/L)			

English Text: total Lycopene(umol/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.0142 to 3.2718	Range of Values	7266	7266	
0.0039	Fill Value of Limit of Detection	2	7268	
.	Missing	714	7982	

LBXLUT	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	Lutein(ug/dL)			

English Text: Lutein(ug/dL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.38 to 88.18	Range of Values	7264	7264	
0.14	Fill Value of Limit of Detection	4	7268	
.	Missing	714	7982	

LBDLUTSI	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Lutein(umol/L)

English Text: Lutein(umol/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.0067 to 1.5502	Range of Values	7264	7264	
0.0025	Fill Value of Limit of Detection	4	7268	
.	Missing	714	7982	

LBXLUZ	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Combined Lutein/zeaxanthin (ug/dL)

English Text: Combined Lutein/zeaxanthin (ug/dL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.57 to 113.05	Range of Values	7267	7267	
0.14	Fill Value of Limit of Detection	1	7268	
.	Missing	714	7982	

LBDLUZSI	Target		
	B(6 Yrs. to 150 Yrs.)		
Hard Edits	**SAS Label**		
	Combined Lutein/zeaxanthin (umol/L)		

English Text: Combined Lutein/zeaxanthin (umol/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.01 to 1.9874	Range of Values	7267	7267	
0.0025	Fill Value of Limit of Detection	1	7268	
.	Missing	714	7982	

LBXLYC	Target		
	B(6 Yrs. to 150 Yrs.)		
Hard Edits	**SAS Label**		
	trans-lycopene(ug/dL)		

English Text: trans-lycopene(ug/dL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.34 to 81.99	Range of Values	7265	7265	
0.21	Fill Value of Limit of Detection	3	7268	
.	Missing	714	7982	

LBDLYCSI		Target		
		B(6 Yrs. to 150 Yrs.)		
Hard Edits		**SAS Label**		
		trans-lycopene(umol/L)		

English Text: trans-lycopene(umol/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.0063 to 1.5275	Range of Values	7265	7265	
0.0039	Fill Value of Limit of Detection	3	7268	
.	Missing	714	7982	

LBXPHF		Target		
		B(6 Yrs. to 150 Yrs.)		
Hard Edits		**SAS Label**		
		Phytofluene(ug/dL)		

English Text: Phytofluene(ug/dL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.35 to 42.08	Range of Values	7209	7209	
0.21	Fill Value of Limit of Detection	59	7268	
.	Missing	714	7982	

LBDPHFSI		Target		
		B(6 Yrs. to 150 Yrs.)		
Hard Edits		**SAS Label**		
		Phytofluene(umol/L)		
English Text: Phytofluene(umol/L)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.0065 to 0.7755	Range of Values	7209	7209	
0.0039	Fill Value of Limit of Detection	59	7268	
.	Missing	714	7982	

LBXPHE		Target		
		B(6 Yrs. to 150 Yrs.)		
Hard Edits		**SAS Label**		
		Phytoene(ug/dL)		
English Text: Phytoene(ug/dL)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.31 to 168.92	Range of Values	7174	7174	
0.21	Fill Value of Limit of Detection	94	7268	
.	Missing	714	7982	

LBDPHESI	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	Phytoene(umol/L)			
English Text: Phytoene(umol/L)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.0057 to 3.1031	Range of Values	7174	7174	
0.0039	Fill Value of Limit of Detection	94	7268	
.	Missing	714	7982	

LBXRPL	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	Retinyl palmitate(ug/dL)			
English Text: Retinyl palmitate(ug/dL)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.13 to 58.52	Range of Values	7127	7127	
0.09	Fill Value of Limit of Detection	141	7268	
.	Missing	714	7982	

LBDRPLSI	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	Retinyl palmitate(umol/L)			
English Text: Retinyl palmitate(umol/L)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.0045 to 2.0429	Range of Values	7127	7127	
0.0031	Fill Value of Limit of Detection	141	7268	
.	Missing	714	7982	

LBXRST	Target			
	B(6 Yrs. to 150 Yrs.)			
Hard Edits	**SAS Label**			
	Retinyl stearate(ug/dL)			
English Text: Retinyl stearate(ug/dL)				
English Instructions:				

Code or Value	Description	Count	Cumulative	Skip to Item
0.11 to 13.01	Range of Values	4761	4761	
0.08	Fill Value of Limit of Detection	2507	7268	
.	Missing	714	7982	

LBDRSTSI	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Retinyl stearate(umol/L)

English Text: Retinyl stearate(umol/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.0038 to 0.4542	Range of Values	4761	4761	
0.0028	Fill Value of Limit of Detection	2507	7268	
.	Missing	714	7982	

LBXVIA	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Retinol(ug/dL)

English Text: Retinol(ug/dL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
6.31 to 164.6	Range of Values	7267	7267	
0.21	Fill Value of Limit of Detection	1	7268	
.	Missing	714	7982	

LBDVIASI	Target		
	B(6 Yrs. to 150 Yrs.)		
Hard Edits	**SAS Label**		
	Retinol(umol/L)		

English Text: Retinol(umol/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.2203 to 5.7462	Range of Values	7267	7267	
0.0073	Fill Value of Limit of Detection	1	7268	
.	Missing	714	7982	

LBXZEA	Target		
	B(6 Yrs. to 150 Yrs.)		
Hard Edits	**SAS Label**		
	Zeaxanthin(ug/dL)		

English Text: Zeaxanthin(ug/dL)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.29 to 25.05	Range of Values	7266	7266	
0.14	Fill Value of Limit of Detection	2	7268	
.	Missing	714	7982	

LBDZEASI	Target
	B(6 Yrs. to 150 Yrs.)
Hard Edits	**SAS Label**
	Zeaxanthin(umol/L)

English Text: Zeaxanthin(umol/L)

English Instructions:

Code or Value	Description	Count	Cumulative	Skip to Item
0.0051 to 0.4404	Range of Values	7266	7266	
0.0025	Fill Value of Limit of Detection	2	7268	
.	Missing	714	7982	