

National Health and Nutrition Examination Survey

2015-2016 Data Documentation, Codebook, and Frequencies

Phthalates and Plasticizers Metabolites - Urine (PHTHTE_I)

Data File: PHTHTE_I.xpt

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Last Revised: NA

Component Description

Phthalates are a group of chemicals used to make plastics more flexible and harder to break. They are often called plasticizers. Some phthalates are used as solvents (dissolving agents) for other materials. They are used in many products, such as vinyl flooring, adhesives, detergents, lubricating oils, automotive plastics, plastic clothes (raincoats), and personal-care products (soaps, shampoos, hair sprays, and nail polishes). Phthalates are used widely in polyvinyl chloride plastics, which are used to make products such as plastic packaging film and sheets, garden hoses, inflatable toys, blood-storage containers, and medical tubing. 1,2-cyclohexane dicarboxylic acid, diisononyl ester (DINCH) is used as a replacement of some high molecular weight phthalates. Once phthalates or DINCH enter a person's body, they are converted into breakdown products (metabolites) that pass out quickly in urine. Biomeasures of phthalates and phthalates alternatives in humans are necessary to evaluate potential human health effects from exposure to these chemicals.

Eligible Sample

All examined participants aged 3 to 5 years were eligible and participants aged 6 years and older from a one-third subsample were eligible.

Description of Laboratory Methodology

The test principle utilizes high performance liquid chromatography-electrospray ionization-tandem mass spectrometry (HPLC-ESI-MS/MS) for the quantitative detection in urine of the following metabolites: monoethyl phthalate (MEP), monobutyl phthalate (MBP), mono-isobutyl phthalate (MiBP), mono(3-carboxypropyl) phthalate (MCP), mono(2-ethylhexyl) phthalate (MEHP), monobenzyl phthalate (MBzP), monoisononyl phthalate (MNP), mono(2-ethyl-5-oxohexyl) phthalate (MEOHP), mono(2-ethyl-5-hydroxyhexyl) phthalate (MEHHP), mono(2-ethyl-5-carboxypentyl) phthalate (MECPP), monocarboxyoctyl phthalate (MCOP), monocarboxynonyl phthalate (MCNP), and cyclohexane-1,2-dicarboxylic acid-mono (hydroxy-isononyl) ester (MHNCH) (Silva, et al., 2007). Urine samples are processed using enzymatic deconjugation of the glucuronidated metabolites followed by on-line solid phase extraction (SPE) coupled with reversed phase HPLC-ESI-MS/MS. Assay precision is improved by incorporating isotopically labeled internal standards of the phthalate metabolites and MHNCH. In addition, 4-methyl umbelliferyl glucuronide is used to monitor deconjugation efficiency. This selective method allows for rapid detection of metabolites of commonly used phthalates and DINCH in human urine with limits of detection in the low ng/mL range.

Refer to the Laboratory Method Files section for a detailed description of the laboratory methods used.

There were no changes to the lab method, lab equipment, or lab site for this component in the NHANES 2015-2016 cycle.

Laboratory Method Files

[Phthalates and Phthalate Alternative Metabolites](#) (October 2018)

Laboratory Quality Assurance and Monitoring

Urine specimens are processed, stored, and shipped to the Division of Laboratory Sciences, National Center for Environmental Health, Centers for Disease Control and Prevention for analysis.

Detailed specimen collection and processing instructions are discussed in the NHANES [Laboratory Procedures Manual \(LPM\)](#). Specimen vials are stored under appropriate frozen (-20°C) conditions until they are shipped to the National Center for Environmental Health for testing.

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 [LPM](#).

Mobile Examination Centers (MECs)

Laboratory team performance is monitored using several techniques. NCHS and contract consultants use a structured competency assessment evaluation during visits to evaluate both the quality of the laboratory work and the quality-control procedures. Each laboratory staff member is observed for equipment operation, specimen collection and preparation; testing procedures and constructive feedback are given to each staff member. Formal retraining sessions are conducted annually to ensure that required skill levels are maintained.

Analytical Laboratories

NHANES uses several methods to monitor the quality of the analyses performed by the contract laboratories. In the MEC, these methods include performing blind split samples collected on "dry run" sessions. In addition, contract laboratories randomly perform repeat testing on 2% of all specimens.

NCHS developed and distributed a quality control protocol for all CDC and contract laboratories, which outlined the use of Westgard rules (Westgard, et al., 1981) when running NHANES specimens. Progress reports containing any problems encountered during shipping or receipt of specimens, summary statistics for each control pool, QC graphs, instrument calibration, reagents, and any special considerations are submitted to NCHS quarterly. The reports are reviewed by NCHS for trends or shifts in the data. The laboratories are required to explain any identified areas of concern.

All QC procedures recommended by the manufacturers were followed. Reported results for all assays meet the Division of Laboratory Sciences' quality control and quality assurance performance criteria for accuracy and precision, similar to the Westgard rules (Caudill, et al., 2008).

Data Processing and Editing

The data were reviewed. Incomplete data or improbable values were sent to the performing laboratory for confirmation.

Analytic Notes

Refer to the [2015-2016 Laboratory Data Overview](#) for general information on NHANES laboratory data.

Subsample Weights

Urinary metals were measured in a full sample of participants ages 3-5 and a one third

subsample of persons 6 years and older. Special sample weights are required to analyze these data properly. Specific sample weights for this subsample are included in this data file and should be used when analyzing these data.

Demographic and Other Related Variables

The analysis of NHANES laboratory data must be conducted using the appropriate survey design and demographic variables. The NHANES [2015-2016 Demographic Data](#) File contains demographic and sample design variables. The recommended procedure for variance estimation requires use of stratum and PSU variables (SDMVSTRA and SDMVPSU, respectively) in the demographic data file.

Starting in the 2015-2016 NHANES cycle, the variable URXUCR (urine creatinine) will not be reported in this file. URXUCR can be found in the data file titled Albumin & Creatinine - Urine.

This laboratory data file can be linked to the other NHANES data files using the unique survey participant identifier SEQN.

Starting in the 2015-2016 NHANES cycle, the variable URXUCR (urine creatinine) will not be reported in this file. URXUCR can be found in the data file titled "Albumin & Creatinine – Urine".

Detection Limits

The detection limits were constant for the analytes in the data set. Two variables are provided for each of these analytes. The variable named ending in "LC" (ex., URDCNPLC) indicates whether the result was below the limit of detection: the value "0" means that the result was at or above the limit of detection, "1" indicates that the result was below the limit of detection. For analytes with analytic results below the lower limit of detection (ex., URDCNPLC=1), an imputed fill value was placed in the analyte results field. This value is the lower limit of detection divided by the square root of 2 ($LLOD/\sqrt{2}$). The other variable prefixed URX (ex., URXCNP) provides the analytic result for the analyte.

The lower limit of detection (LLOD, in ng/mL) for the phthalates and plasticizers metabolites:

VARIABLE NAME	SAS LABEL	LLOD
URXCNP	Mono(carboxyisononyl) phthalate (ng/mL)	0.2
URXCOP	Mono(carboxyisoctyl) phthalate (ng/mL)	0.3
URXECF	Mono-2-ethyl-5-carboxypentyl phthalate (ng/mL)	0.4
URXHIBP	MHIBP phthalate (ng/mL)	0.4
URXMBP	Mono-n-butyl phthalate (ng/mL)	0.4
URXMC1	Mono-(3-carboxypropyl) phthalate (ng/mL)	0.4
URXMCOH	MCOCH phthalate (ng/mL)	0.5
URXMEP	Mono-ethyl phthalate (ng/mL)	1.2
URXMHBP	Mono-3-hydroxy-n-butyl phthalate (ng/mL)	0.4
URXMHH	Mono-(2-ethyl-5-hydroxyhexyl) phthalate (ng/mL)	0.4
URXMHNC	Cyclohexane 1,2-dicarboxylic acid monohydroxy isononyl ester (ng/mL)	0.4
URXMHP	Mono-(2-ethyl)-hexyl phthalate (ng/mL)	0.8
URXMIB	Mono-isobutyl phthalate (ng/mL)	0.8
URXMNP	Mono-isononyl phthalate (ng/mL)	0.9
URXMOH	Mono-(2-ethyl-5-oxohexyl) phthalate (ng/mL)	0.2
URXMZP	Mono-benzyl phthalate (ng/mL)	0.3

Please refer to the NHANES [Analytic Guidelines](#) and the on-line NHANES [Tutorial](#) for further details on the use of sample weights and other analytic issues.

References

- Caudill, S.P., Schleicher, R.L., Pirkle, J.L. Multi-rule quality control for the age-related eye disease study. *Statist. Med.* (2008) 27(20):4094-40106.
- Silva MJ, Samandar E, Preau JL Jr, Reidy JA, Needham LL, Calafat AM. Quantification of 22 phthalate metabolites in human urine. *J Chromatogr B Analyt Technol Biomed Life Sci.* 2007 Dec 1;860(1):106-12.
- Westgard JO, Barry PL, Hunt MR, Groth T. A multi-rule Shewhart chart for quality control in clinical chemistry. *Clin Chem.* 1981 Mar;27(3):493-501.

Codebook and Frequencies

SEQN - Respondent sequence number

Variable Name:	SEQN
SAS Label:	Respondent sequence number
English Text:	Respondent sequence number.
Target:	Both males and females 3 YEARS - 150 YEARS

WTSB2YR - Environmental B 2-year weights

Variable Name: WTSB2YR
SAS Label: Environmental B 2-year weights
English Text: Environmental B 2-year weights
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
6552.119284 to 874638.01159	Range of Values	3149	3149	
0	Participants 6+ years with no lab specimen	56	3205	
.	Missing	0	3205	

URXCNP - Mono(carboxynonyl) Phthalate (ng/mL)

Variable Name: URXCNP**SAS Label:** Mono(carboxynonyl) Phthalate (ng/mL)**English Text:** Mono(carboxynonyl) Phthalate (ng/mL)**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.14 to 246.4	Range of Values	2975	2975	
.	Missing	230	3205	

URDCNPLC - Mono(carboxynonyl) Phthalate cmt code

Variable Name: URDCNPLC
SAS Label: Mono(carboxynonyl) Phthalate cmt code
English Text: Mono(carboxynonyl) phthalate comment code
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2915	2915	
1	Below lower detection limit	60	2975	
.	Missing	230	3205	

URXCOP - Mono(carboxyoctyl) Phthalate (ng/mL)

Variable Name: URXCOP**SAS Label:** Mono(carboxyoctyl) Phthalate (ng/mL)**English Text:** Mono(carboxyoctyl) Phthalate (ng/mL)**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.21 to 1096.7	Range of Values	2975	2975	
.	Missing	230	3205	

URDCOPLC - Mono(carboxyoctyl) phthalate cmt code

Variable Name: URDCOPLC
SAS Label: Mono(carboxyoctyl) phthalate cmt code
English Text: Mono(carboxyoctyl) phthalate comment code
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2959	2959	
1	Below lower detection limit	16	2975	
.	Missing	230	3205	

URXECP - MECP phthalate (ng/mL)

Variable Name: URXECP**SAS Label:** MECP phthalate (ng/mL)**English Text:** Mono-2-ethyl-5-carboxypentyl phthalate (ng/mL)**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.28 to 621.3	Range of Values	2975	2975	
.	Missing	230	3205	

URDECPLC - MECP phthalate comment code

Variable Name: URDECPLC
SAS Label: MECP phthalate comment code
English Text: Mono-2-ethyl-5-carboxypentyl phthalate comment code
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2969	2969	
1	Below lower detection limit	6	2975	
.	Missing	230	3205	

URXHIBP - MHIBP phthalate (ng/mL)

Variable Name: URXHIBP
SAS Label: MHIBP phthalate (ng/mL)
English Text: Mono-2-hydroxy-iso-butyl phthalate (ng/mL)
Target: Both males and females 3 YEARS - 150 YEARS
Hard Edits: 0.0000 to 99999.9900

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.28 to 533	Range of Values	2975	2975	
.	Missing	230	3205	

URDHIBLC - MHIBP phthalate Comment Code

Variable Name: URDHIBLC
SAS Label: MHIBP phthalate Comment Code
English Text: Mono-2-hydroxy-iso-butyl phthalate Comment Code
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2863	2863	
1	Below lower detection limit	112	2975	
.	Missing	230	3205	

URXMBP - Mono-n-butyl phthalate (ng/mL)

Variable Name: URXMBP**SAS Label:** Mono-n-butyl phthalate (ng/mL)**English Text:** Mono-n-butyl phthalate (ng/mL)**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.28 to 1792.3	Range of Values	2975	2975	
.	Missing	230	3205	

URDMBPLC - Mono-n-butyl phthalate comment code

Variable Name: URDMBPLC
SAS Label: Mono-n-butyl phthalate comment code
English Text: Mono-n-butyl phthalate comment code
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2954	2954	
1	Below lower detection limit	21	2975	
.	Missing	230	3205	

URXMC1 - Mono-(3-carboxypropyl) phthalate (ng/mL)

Variable Name: URXMC1
SAS Label: Mono-(3-carboxypropyl) phthalate (ng/mL)
English Text: Mono-(3-carboxypropyl) phthalate (ng/mL)
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.28 to 297.4	Range of Values	2975	2975	
.	Missing	230	3205	

URDMC1LC - Mono-(3-carboxypropyl) phthalate cmt

Variable Name: URDMC1LC
SAS Label: Mono-(3-carboxypropyl) phthalate cmt
English Text: Mono-(3-carboxypropyl) phthalate comment code
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2437	2437	
1	Below lower detection limit	538	2975	
.	Missing	230	3205	

URXMCOH - MCOCH phthalate (ng/mL)

Variable Name: URXMCOH

SAS Label: MCOCH phthalate (ng/mL)

English Text: Cyclohexane-1,2-dicarboxylic acid-mono(carboxyoctyl) ester phthalate (ng/mL)

Target: Both males and females 3 YEARS - 150 YEARS

Hard Edits: 0.0000 to 99999.99000

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.35 to 285.4	Range of Values	2975	2975	
.	Missing	230	3205	

URDMCOLC - MCOCH phthalate Comment Code

Variable Name: URDMCOLC**SAS Label:** MCOCH phthalate Comment Code**English Text:** Cyclohexane-1,2-dicarboxylic acid-mono(carboxyoctyl) ester
phthalate Comment Code**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above detection limit	1783	1783	
1	Below lower detection limit	1192	2975	
.	Missing	230	3205	

URXMEP - Mono-ethyl phthalate (ng/mL)

Variable Name: URXMEP
SAS Label: Mono-ethyl phthalate (ng/mL)
English Text: Mono-ethyl phthalate (ng/mL)
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.85 to 15021	Range of Values	2975	2975	
.	Missing	230	3205	

URDMEPLC - Mono-ethyl phthalate comment code

Variable Name: URDMEPLC
SAS Label: Mono-ethyl phthalate comment code
English Text: Mono-ethyl phthalate comment code
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2963	2963	
1	Below lower detection limit	12	2975	
.	Missing	230	3205	

URXMHBP - Mono-3-hydroxy-n-butyl phthalate (ng/mL)

Variable Name: URXMHBP
SAS Label: Mono-3-hydroxy-n-butyl phthalate (ng/mL)
English Text: Mono-3-hydroxy-n-butyl phthalate (ng/mL)
Target: Both males and females 3 YEARS - 150 YEARS
Hard Edits: 0.0000 to 99999.9900

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.28 to 240.6	Range of Values	2975	2975	
.	Missing	230	3205	

URDMHBLC - MHBP phthalate Comment Code

Variable Name: URDMHBLC**SAS Label:** MHBP phthalate Comment Code**English Text:** Mono-3-hydroxy-n-butyl phthalate Comment Code**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above detection limit	2327	2327	
1	Below lower detection limit	648	2975	
.	Missing	230	3205	

URXMHH - MEHP phthalate (ng/mL)

Variable Name: URXMHH**SAS Label:** MEHP phthalate (ng/mL)**English Text:** Mono-(2-ethyl-5-hydroxyhexyl) phthalate (ng/mL)**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.28 to 559.9	Range of Values	2975	2975	
.	Missing	230	3205	

URDMHHLC - MEHP phthalate comment code

Variable Name: URDMHHLC**SAS Label:** MEHP phthalate comment code**English Text:** Mono-(2-ethyl-5-hydroxyhexyl) phthalate comment code**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2961	2961	
1	Below lower detection limit	14	2975	
.	Missing	230	3205	

URXMHNC - MHNCH (ng/mL)

Variable Name: URXMHNC

SAS Label: MHNCH (ng/mL)

English Text: Cyclohexane 1,2-dicarboxylic acid monohydroxy isononyl ester (ng/mL)

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.28 to 1051.9	Range of Values	2975	2975	
.	Missing	230	3205	

URDMCHLC - MHNCH comment code

Variable Name: URDMCHLC**SAS Label:** MHNCH comment code**English Text:** Cyclohexane 1,2-dicarboxylic acid monohydroxy isononyl ester
comment code**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	1977	1977	
1	Below lower detection limit	998	2975	
.	Missing	230	3205	

URXMHP - Mono-(2-ethyl)-hexyl phthalate (ng/mL)

Variable Name: URXMHP**SAS Label:** Mono-(2-ethyl)-hexyl phthalate (ng/mL)**English Text:** Mono-(2-ethyl)-hexyl phthalate (ng/mL)**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.57 to 152.3	Range of Values	2975	2975	
.	Missing	230	3205	

URDMHPLC - Mono-(2-ethyl)-hexyl phthalate cmt code

Variable Name: URDMHPLC
SAS Label: Mono-(2-ethyl)-hexyl phthalate cmt code
English Text: Mono-(2-ethyl)-hexyl phthalate comment code
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	1853	1853	
1	Below lower detection limit	1122	2975	
.	Missing	230	3205	

URXMIB - Mono-isobutyl phthalate (ng/mL)

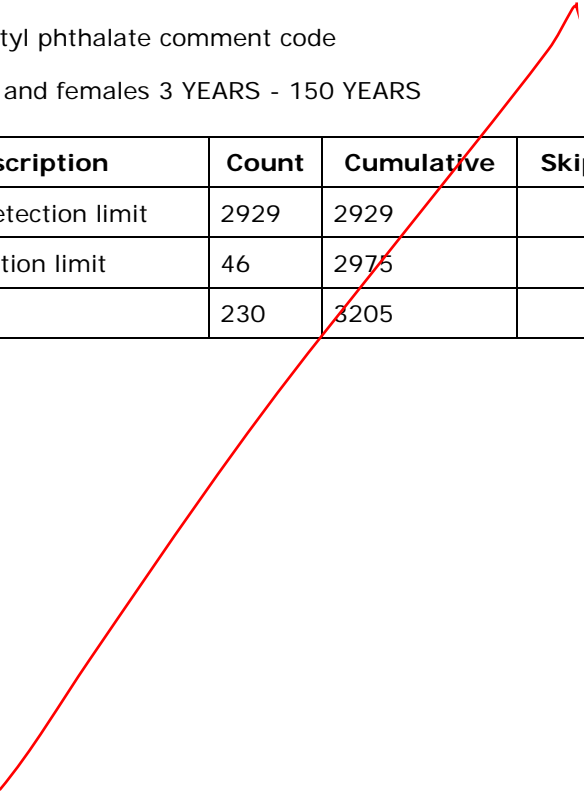
Variable Name: URXMIB**SAS Label:** Mono-isobutyl phthalate (ng/mL)**English Text:** Mono-isobutyl phthalate (ng/mL)**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.57 to 1384.8	Range of Values	2975	2975	
.	Missing	230	3205	

URDMIBLC - Mono-isobutyl phthalate comment code

Variable Name: URDMIBLC
SAS Label: Mono-isobutyl phthalate comment code
English Text: Mono-isobutyl phthalate comment code
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2929	2929	
1	Below lower detection limit	46	2975	
.	Missing	230	3205	



URXMNP - Mono-isononyl phthalate (ng/mL)

Variable Name: URXMNP**SAS Label:** Mono-isononyl phthalate (ng/mL)**English Text:** Mono-isononyl phthalate (ng/mL)**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.64 to 875.4	Range of Values	2975	2975	
.	Missing	230	3205	

URDMNPLC - Mono-isononyl phthalate comment code

Variable Name: URDMNPLC
SAS Label: Mono-isononyl phthalate comment code
English Text: Mono-isononyl phthalate comment code
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	793	793	
1	Below lower detection limit	2182	2975	
.	Missing	230	3205	

URXMOH - MEOH phthalate (ng/mL)

Variable Name: URXMOH**SAS Label:** MEOH phthalate (ng/mL)**English Text:** Mono-(2-ethyl-5-oxohexyl) phthalate (ng/mL)**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.14 to 300.5	Range of Values	2975	2975	
.	Missing	230	3205	

URDMOHL - MEOH phthalate comment code

Variable Name: URDMOHL

SAS Label: MEOH phthalate comment code

English Text: Mono-(2-ethyl-5-oxohexyl) phthalate comment code

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2959	2959	
1	Below lower detection limit	16	2975	
.	Missing	230	3205	

URXMZP - Mono-benzyl phthalate (ng/mL)

Variable Name: URXMZP
SAS Label: Mono-benzyl phthalate (ng/mL)
English Text: Mono-benzyl phthalate (ng/mL)
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.21 to 1525.1	Range of Values	2975	2975	
.	Missing	230	3205	

URDMZPLC - Mono-benzyl phthalate comment code

Variable Name: URDMZPLC
SAS Label: Mono-benzyl phthalate comment code
English Text: Mono-benzyl phthalate comment code
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	At or above the detection limit	2913	2913	
1	Below lower detection limit	62	2975	
.	Missing	230	3205	