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What's New and Different?

The *Updated Tables, March 2021* includes chemicals that have results available from the NHANES survey periods 1999–2000 through 2015–2016.

Updated Tables in Four Volumes

The *Updated Tables, March 2021* has been reorganized and expanded into **four volumes**, each a separate document. Data for chemicals measured in individual samples from the general U.S. population are found in Volumes One and Two. Other types of data, such as measurements in pooled samples or from special subsets of the NHANES population, are in Volumes Three and Four. The format of each document is compliant with Section 508 Accessibility requirements to assist visually impaired users.

Volumes are organized chronologically, with **Volume One** containing data from NHANES 1999-2010 and **Volume Two** containing data from NHANES 2011-2016. Within each volume, chemical groups and their analytes are listed in a navigable table of contents on the left side pane.

As an example, if users are interested in blood lead data from NHANES 2013-2014, they would open Volume Two, scroll down to the “Metals and Metalloids” section within the navigable table of contents in the left side pane, expand the section, select “Lead,” and then find the rows containing summary data for NHANES 2013-2014. Users interested in analyzing trends in biomonitoring data may wish to access tables in both volumes, which together contain all the years of available data for the general U.S. population.

Volume Three: Analysis of Pooled Serum Samples for Select Chemicals, NHANES 2005-2016 presents data tables for persistent organic pollutants and pesticides that were measured in pooled samples. Data tables for these chemicals that are based on individual samples can be found in Volume One: NHANES 1999-2010.

Volume Four: Analysis of Chemicals Found in Cigarette Smoke in a Special Sample of U.S. Adults, NHANES 2011-2016 presents data for a sample of adult cigarette smokers and nonsmokers from NHANES 2011-2012 through 2015-2016.

New Chemicals

Chemicals reported for the first time and those measured in a new matrix include:

- Adducts of hemoglobin in the general population and in a special sample of adult smokers and nonsmokers
 - Formaldehyde
- Urinary tobacco alkaloids and metabolites in the general population and in a special sample of adult smokers and nonsmokers
 - Anabasine
 - Anatabine
 - Cotinine
 - Cotinine-n-oxide
 - Hydroxycotinine
 - Trans-3'-hydroxycotinine
 - 1-(3-Pyridyl)-1-butanol-4-carboxylic acid
 - Nicotine

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- Nicotine-N'-oxide
 - Nornicotine
- Urinary tobacco-specific nitrosamines (TSNAs)
 - N'-Nitrosoanabasine (NAB)
 - N'-Nitrosoanatabine (NAT)
 - N'-Nitrosonornicotine (NNN)
- Urinary volatile N-nitrosamine compounds (VNAs) in the general population and in a special sample of adult smokers and nonsmokers
 - N-Nitrosodiethylamine (NDEA)
 - N-Nitrosoethylmethylamine (NMEA)
 - N-Nitrosomorpholine (NMOR)
 - N-Nitrosopiperidine (NPIP)
 - N-Nitrosopyrrolidine (NPYR)
- Urinary flame retardants
 - Dicyclic phosphates (DCPs)
- Urinary insect repellent and metabolites
 - 3-(Ethylcarbamoyl) benzoic acid (ECBA)
- Urinary neonicotinoids
 - Acetamiprid
 - Clothianidin
 - N-desmethylacetamiprid
 - 5-hydroxyimidacloprid
 - Imidacloprid
 - Thiacloprid
- Urinary per- and polyfluoroalkyl substances (PFAS)
 - Perfluorobutanoic acid (PFBA)
 - Perfluorobutane sulfonic acid (PFBS)
 - Perfluorodecanoic acid (PFDA)
 - Perfluoroheptane sulfonic acid (PFHpS)
 - Perfluoroheptanoic acid (PFHpA)
 - Perfluorohexane sulfonic acid (PFHxS)
 - Perfluorohexanoic acid (PFHxA)
 - Perfluorononanoic acid (PFNA)
 - N-perfluorooctanoic acid (n-PFOA)
 - Branched perfluorooctanoic acid isomers (Sb-PFOA)
 - N-perfluorooctane sulfonic acid (n-PFOS)
 - Branched perfluoromethylheptane sulfonic acid isomers (Sm-PFOS)
 - Perfluoropentanoic acid (PFPeA)
 - Perfluoroundecanoic acid (PFUnDA)
 - 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9Cl-PF3ONS)
 - Adona (ammonium salt of 4,8-dioxo-3H-perfluorononanoic acid)
 - GenX (ammonium salt of 2,3,3,3-tetrafluoro-2-(1,1,2,2,3,3,3-heptafluoropropoxy)-propanoic acid (HFPO-DA))
- Serum sex steroid hormones
 - Estradiol
 - Sex hormone-binding globulin (SHBG)
 - Total testosterone

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- Urinary volatile organic compound (VOC) metabolites
 - N-Acetyl-S-(1-cyano-2-hydroxyethyl)-L-cysteine
 - N-Acetyl-S-(2-hydroxy-3-methyl-3-buten-1-yl)-L-cysteine + N-Acetyl-S-[1-(hydroxymethyl)-2-methyl-2-propen-1-yl]-L-cysteine
 - N-Acetyl-S-(4-hydroxy-2-methyl-2-buten-1-yl)-L-cysteine
- Serum aldehydes in the general population and in a special sample of adult smokers and nonsmokers
 - Benzaldehyde
 - Butyraldehyde
 - Crotonaldehyde
 - Decanaldehyde
 - Heptanaldehyde
 - Hexanaldehyde
 - Isopentanaldehyde
 - Nonanaldehyde
 - Octanaldehyde
 - Pentanaldehyde
 - Propanaldehyde
 - O-Tolualdehyde
- Urinary aromatic amines in the general population and in a special sample of adult smokers and nonsmokers
 - 4-Aminobiphenyl
 - 1-Aminonaphthalene
 - 2-Aminonaphthalene
 - O-Anisidine
 - 2,6-Dimethylaniline
 - O-Toluidine
- Urinary aromatic diamines
 - 4,4'-Diaminodiphenylmethane (4MDA)
 - 1,5-Diaminonaphthalene (5NDA)
 - 2,4-Diaminotoluene (4TDA)
 - 2,6-Diaminotoluene (6TDA)
 - P-Phenylenediamine (PPDA)

Updated Data

Chemical groups with updated data in this release are:

- Adducts of Hemoglobin
- Tobacco Alkaloids and Metabolites
- Tobacco-Specific Nitrosamines
- Personal Care and Consumer Product Chemicals and Metabolites
- Flame Retardant Metabolites
- Herbicides and Metabolites
- Insect Repellent and Metabolites
- Organophosphorus Insecticides: Dialkyl Phosphate Metabolites
- Organochlorine Pesticides and Metabolites
- Polybrominated diphenyl ethers and PBB 153

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- Dioxin-like Polychlorinated Biphenyls: mono-ortho-substituted PCBs
- Polychlorinated Biphenyls: Non-Dioxin-Like
- Metals and metalloids
- Perchlorate and Other Anions
- Phthalate and Phthalate Alternative Metabolites
- Volatile Organic Compound (VOC) Metabolites

Stratification by Cigarette Smoking Status

For the first time, summary statistics for chemicals within the following sections have been stratified by cigarette smoking status, which is defined as a serum cotinine concentration more than 10 ng/mL in adults participants from NHANES, excluding those who reported using other tobacco products.

- Tobacco alkaloids and metabolites
- TSNA
- Aromatic amines

Change in the Population Sampled for Urinary Chemicals: NHANES 2015–2016

Beginning with the NHANES 2015–2016 survey period, the age for urine collection was lowered from age 6 years to age 3 years. This change was made to obtain data for younger children, a vulnerable population with limited urinary data. The urinary environmental chemicals are measured in a full sample (i.e., all children able to provide a urine specimen) of children 3 to 5 years old. For ages 6 years and older, the urinary environmental chemicals are measured in a representative one-third sample of participants.

The addition of ages 3 to 5 years to the survey population will mean that descriptive statistics (geometric mean, selected percentiles) for the total population and non-age-related demographic groups in NHANES 2015–2016 will not be directly comparable to descriptive statistics in earlier NHANES survey periods. This is because the populations sampled are not equivalent.

PFOS and PFOA Results for NHANES 2013–2014 and 2015–2016

Starting in 2013, we began measuring linear and branched isomers of both PFOS and PFOA and no longer measured total PFOS and total PFOA. Collectively, the isomers of each chemical represent more than 95% of what was previously reported as PFOS and PFOA. Data tables for each of the four isomers are also presented.

PFOS and PFOA are calculated by summing the linear and branched isomers for each participant before applying the appropriate sample weight. Because the 2013–2014 and 2015–2016 values are a calculated sum, there is no limit of detection (LOD) for PFOS and PFOA. See [Calculation of PFOS and PFOA as the Sum of Isomers](#) for more details. The calculated PFOS and PFOA results can be used to compare with previous measurements and to examine trends in the general U.S. population.

“What’s New and Different” Archives

The “What’s New and Different” sections from previous releases of *Updated Tables* are available in the archives from *Updated Tables* at: <https://www.cdc.gov/exposurereport/>.