Third National Report on Human Exposure to Environmental Chemicals

2005

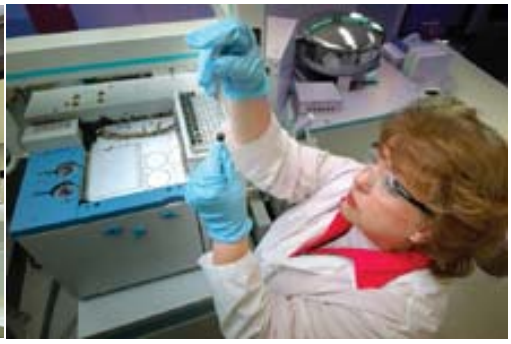
Executive Summary

DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

CDC
Environmental Health

About CDC's Environmental Health Laboratory

Using advanced laboratory science and innovative techniques, the Environmental Health Laboratory at the National Center for Environmental Health (NCEH) at the Centers for Disease Control and Prevention (CDC) has been in the forefront of efforts to assess people's exposure to environmental chemicals. CDC's highly trained laboratory scientists have built on more than three decades of experience in measuring chemicals directly in people's blood or urine, a process known as biomonitoring. Biomonitoring measurements are the most health-relevant assessments of exposure because they measure the amount of the chemical that actually gets into people from all environmental sources (e.g., air, soil, water, dust, or food) combined. With a few exceptions, it is the concentration of the chemical in people that provides the best exposure information to evaluate the potential for adverse health effects.



Background

The *National Report on Human Exposure to Environmental Chemicals* is a report of the ongoing assessment of the exposure of the U.S. population to environmental chemicals using biomonitoring. The *Second National Report on Human Exposure to Environmental Chemicals (Second Report)* was released in 2003 and presented biomonitoring exposure data for 116 environmental chemicals for the civilian, noninstitutionalized U.S. population over the 2-year period from 1999 to 2000. This *Third Report* presents similar exposure data for the U.S. population for 148 environmental chemicals over the period from 2001 to 2002. The *Third Report* also includes the data from the *Second Report*, that is, data for 1999-2000.

The Environmental Health Laboratory measured chemicals or their metabolites in blood and urine samples from a random sample of participants from the National Health and Nutrition Examination Survey (NHANES) that is conducted by CDC's National Center for Health Statistics. NHANES is a series of surveys that in 1999 began continuous operation to provide results for a survey sample of the U.S. population every 2 years.

For this *Report*, an environmental chemical means a chemical compound or chemical element present in air, water, food, soil, dust, or other environmental media (for example, consumer products). Biomonitoring may measure the chemical or its metabolite in blood or urine. A metabolite is a substance produced when body tissues chemically alter the original compound. Blood and urine levels reflect the amount of the chemical that actually gets into the body from the environment.

The chemicals covered in the *Third Report* that were not covered in previous versions of the *Report* are as follows:

- pyrethroid insecticides
- additional polycyclic aromatic hydrocarbons (including benzo-[a]-pyrene)
- aldrin, endrin, and dieldrin
- additional phthalate metabolites
- additional pesticides and herbicides
- additional dioxins, furans, and polychlorinated biphenyls (PCBs)

Public Health Uses of the *Report*

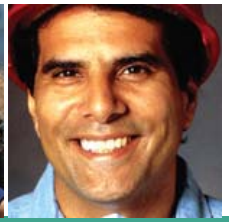
The *Report* provides unique exposure information to scientists, physicians, and health officials to help prevent disease that results from exposure to environmental chemicals. Specific public health uses of the exposure information in the *Third Report* are:

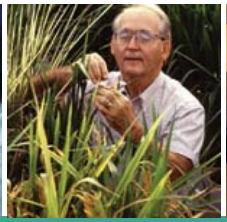
- to determine which chemicals get into Americans and at what concentrations;
- for chemicals with a known toxicity level, to determine the proportion of the population with levels above those associated with adverse health effects;
- to establish reference ranges that can be used by physicians and scientists to determine whether a person or group has an unusually high exposure;
- to assess the effectiveness of public health efforts to reduce exposure of Americans to specific chemicals;
- to determine whether exposure levels are higher among minorities, children, women of childbearing age, or other vulnerable groups;
- to track, over time, trends in levels of exposure of the population; and
- to set priorities for research on human health effects of exposure.

Interpreting the Data

Just because people have an environmental chemical in their blood or urine does not mean that the chemical causes disease. The toxicity of a chemical is related to its dose or concentration in addition to a person's individual susceptibility. Small amounts may be of no health consequence, whereas larger amounts may cause adverse health effects. Research studies, separate from the *Report*, are required to determine which levels of a chemical may cause health effects and which levels are not a significant health concern. For some chemicals, such as lead, research studies provide a good understanding of health risks associated with various blood levels. For most of the environmental chemicals for which information is presented in the *Report*, more research is needed to determine whether exposure at levels reported here is a cause for health concern. CDC conducts and provides biomonitoring measurements for this type of research in collaboration with other agencies and institutions.

The *Third Report* presents data collected to provide estimates of exposure for the civilian, noninstitutionalized U.S. population. The current survey design does not permit CDC to estimate exposure on a state-by-state or city-by-city basis. For example, CDC cannot extract a subset of data and examine levels of blood lead that represent a state population.

Key Highlights and Findings

First-Time Exposure Information for the U.S. Population for 38 of the 148 Chemicals Included in the *Report*

These 38 chemicals are pyrethroid insecticides; the organochlorine pesticides aldrin, endrin, and dieldrin; additional polycyclic aromatic hydrocarbons (including benzo-[a]-pyrene); additional phthalate metabolites; additional dioxins, furans, and polychlorinated biphenyls; and additional pesticides and herbicides. As a result of measuring these chemicals, population "reference ranges" for blood and urine concentrations of the chemicals, including 95th percentiles, are available for the first time. The 95th percentile level means that 95% of the samples of serum, blood, or urine from the population have concentrations below that level. Public health officials use the reference ranges to determine whether groups of people are experiencing an exposure that is unusual compared with an exposure experienced by the rest of the population.

Continued Progress in Reducing Blood Lead Levels in Children

New data on blood lead levels in children aged 1 to 5 years enable estimates of the number of children with elevated levels (that is, levels greater than or equal to 10 µg/dL). For the period 1999-2002, 1.6% of children aged 1 to 5 years had elevated blood lead levels. This percentage has decreased from 4.4% in the early 1990s.

These data document that public health efforts to reduce the number of children with elevated blood lead levels in the general population continue to be successful. However, other data show that special populations of children at high risk for lead exposure (for example, children living in homes containing lead-based paint or lead-contaminated dust) have higher rates of elevated blood lead levels and remain a major public health concern. Since no safe blood lead level in children has been identified, emphasis should be placed on efforts to control or eliminate lead in children's environment before children are exposed.

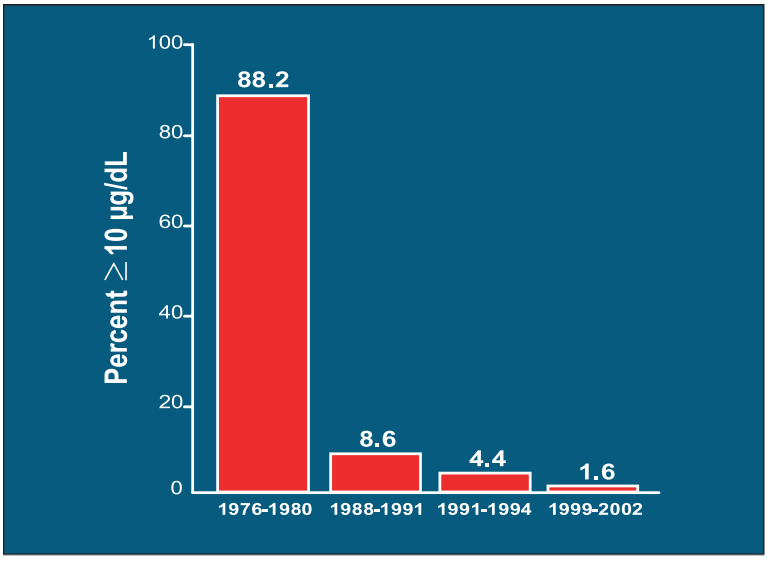


Figure 1. Percentage of children 1-5 years old in the U.S. population with elevated blood lead levels (≥µg/dL)

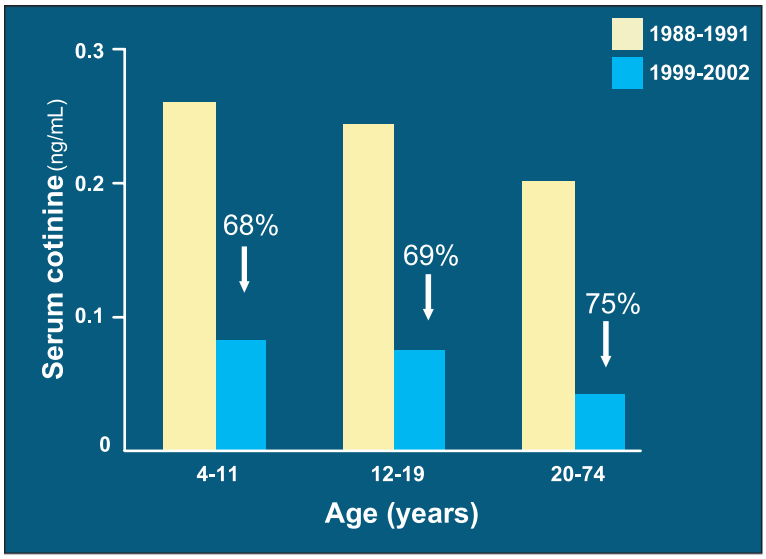


Figure 2. Serum cotinine levels tracking exposure to secondhand smoke in the non-smoking U.S. population

Exposure to Environmental Tobacco Smoke

Cotinine is a metabolite of nicotine, and levels of cotinine in blood track exposure to environmental tobacco smoke (ETS) in people who do not smoke. Higher cotinine levels indicate more exposure to ETS, which has been identified as a human carcinogen. Data on blood cotinine levels for the U.S. population are available for 1988-1991 from previous work at CDC. With this *Third Report*, data are now available for the period 1999-2002.

Compared with results from the period 1988-1991, the 1999-2002 data show that median cotinine levels in nonsmokers have decreased 68% for children, 69% for adolescents, and about 75% for adults. Non-Hispanic blacks have levels more than twice those of Mexican Americans and non-Hispanic whites. Children's levels are more than twice those of adults. Efforts to reduce ETS exposure in the population show significant progress, but ETS exposure remains a major public health concern.

Exposure to Cadmium

Recent research studies have shown that urine cadmium levels as low as 1 µg per gram of creatinine in people may be associated with subtle kidney injury (that is, injury that may not be readily apparent) and with an increased risk for low bone-mineral density. CDC is not establishing a new level of health concern in this *Report*, but is noting how population urine cadmium levels compare with results of recent research. The *Third Report* shows that about 5% of the U.S. population aged 20 years and older had urinary cadmium levels at or near these levels. Cigarette smoking is the most likely source for these higher cadmium levels. These cadmium findings should promote further research on the public health consequences of cadmium in people.

Key Highlights and Findings cont'd

Encouraging Findings About Exposure to the Organochlorine Pesticides Aldrin, Endrin, and Dieldrin

These three pesticides are similar and were once widely used insecticides in agricultural applications, particularly for cotton and corn. Agricultural uses of aldrin and dieldrin were discontinued in the United States in 1970, and termite control ended in 1987. Production and use of endrin was discontinued in 1986. Although these pesticides are no longer used in the United States, they are still used in other countries. Results from the *Third Report* show undetectable or very low serum levels of each of these organochlorine pesticides.

Improved Markers for Phthalate Exposure

Phthalates are "plasticizers," the name given to a group of chemicals that soften and increase the flexibility of plastics and vinyl. Exposure to these plasticizers is widespread. Newly identified markers give a better indication of exposure. Animal studies have demonstrated reproductive toxicity and other effects of phthalates. Currently, very limited scientific information is available on potential human health effects of phthalates at levels presented for the U.S. population in the *Report.*

Better Human Exposure Data for Dioxin-like Compounds

The *Third Report* provides data for 29 dioxins, furans, and dioxin-like polychlorinated biphenyls that now have generally lower limits of detection than they did previously. Results for three of these chemicals are presented for the first time in this *Report*. The new exposure information for dioxins and related compounds will substantively improve risk assessments currently in progress to determine health risks to the U.S. population from exposure to this family of chemicals.

Mercury Exposure Among Women of Childbearing Age (16-49 Years)

Most of the mercury in blood comes from the consumption of fish or shellfish which accumulate methylmercury from water and soil. Mercury exposure is important to monitor in women of childbearing age because mercury can cause adverse neurodevelopmental effects in the developing fetus at blood levels potentially attainable through dietary sources. Data from the *Third Report* for the period 1999-2002 show that all women of childbearing age had levels below 58 µg per liter (µg/L), a concentration associated with neurodevelopmental effects in the fetus.

However, mercury levels in these women continue to merit close monitoring because 5.7% of women of childbearing age had levels within a factor of 10 of those associated with neurodevelopmental effects. Defining safe levels of mercury in blood continues to be an active research area.

New Measures for Some of the Widely Used Pyrethroid Insecticides

Pyrethroids are a group of synthetic insecticides that are now the most commonly used insecticides applied around the home. The *Third Report* presents first-time exposure information for five commonly used pyrethroid insecticides. The findings suggest widespread exposure to pyrethroid insecticides, since 3-phenoxybenzoic acid, a common metabolite of several pyrethroid insecticides, was found in much of the U.S. population. Currently, very limited scientific information is available on potential human health effects of pyrethroid pesticides at levels presented for the U.S. population in the *Report*.

Chemicals in the *Report*

Exposure data on the following chemicals or classes of chemicals appear in CDC's *Third National Report on Human Exposure to Environmental Chemicals*. This *Third Report* provides updated exposure information on the chemicals in the *Second Report* and first-time information on additional chemicals (in green).

Metals

Antimony
Barium
Beryllium
Cadmium
Cesium
Cobalt
Lead
Mercury
Molybdenum
Platinum
Tungsten
Thallium
Uranium

Tobacco Smoke

Cotinine

Phytoestrogens

Daidzein
Enterodiol
Enterolactone
Equol
Genistein
O-Desmethylangolensin

Polycyclic Aromatic Hydrocarbons

1-Hydroxybenz[a]anthracene
3- and 9-Hydroxybenz[a]anthracene
1-Hydroxybenzo[c]phenanthrene
2-Hydroxybenzo[c]phenanthrene
3-Hydroxybenzo[c]phenanthrene
1-Hydroxychrysene
2-Hydroxychrysene
3-Hydroxychrysene
4-Hydroxychrysene
6-Hydroxychrysene
3-Hydroxyfluoranthene*
2-Hydroxyfluorene
3-Hydroxyfluorene
9-Hydroxyfluorene
1-Hydroxyphenanthrene
2-Hydroxyphenanthrene
3-Hydroxyphenanthrene
4-Hydroxyphenanthrene
9-Hydroxyphenanthrene
1-Hydroxypyrene
3-Hydroxybenzo[a]pyrene
1-Hydroxynapthalene
2-Hydroxynapthalene

Phthalates

Mono-methyl phthalate
Mono-ethyl phthalate
Mono-n-butyl phthalate
Mono-isobutyl phthalate
Mono-benzyl phthalate
Mono-cyclohexyl phthalate
Mono-2-ethylhexyl phthalate
Mono-(2-ethyl-5-oxohexyl) phthalate
Mono-(2-ethyl-5-hydroxyhexyl) phthalate
Mono-n-octyl phthalate
Mono-(3-carboxypropyl) phthalate
Mono-isononyl phthalate

Organochlorine Pesticides

Hexachlorobenzene
Beta-hexachlorocyclohexane
Gamma-hexachlorocyclohexane
Pentachlorophenol
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
p,p'-DDT
p,p'-DDE
o,p'-DDT
Oxychlordane
trans-Nonachlor
Heptachlor epoxide
Mirex
Aldrin
Dieldrin
Endrin

Organophosphate Insecticides: Dialkyl Phosphate Metabolites

Dimethylphosphate
Dimethylthiophosphate
Dimethyldithiophosphate
Diethylphosphate
Diethylthiophosphate
Diethyldithiophosphate

Organophosphate Insecticides: Specific Metabolites

Malathion dicarboxylic acid*
para-Nitrophenol
3,5,6-Trichloro-2-pyridinol
2-Isopropyl-4-methyl-6-hydroxypyrimidine
2-(Diethylamino)-6-methylpyrimidin-4-ol/one
3-Chloro-7-hydroxy-4-methyl-2H-chromen-2-one/ol

Herbicides

2,4,5-Trichlorophenoxyacetic acid
2,4-Dichlorophenoxyacetic acid
2,4-Dichlorophenol
Alachlor mercapturate*
Atrazine mercapturate
Acetochlor mercapturate
Metolachlor mercapturate

Pyrethroid Pesticides

4-Fluoro-3-phenoxybenzoic acid
***cis*-3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid**
***trans*-3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid**
***cis*-3-(2,2-Dibromovinyl)-2,2-dimethylcyclopropane carboxylic acid**
3-Phenoxybenzoic acid

Other Pesticides

N,N-Diethyl-3-methylbenzamide
ortho-Phenylphenol
2,5-Dichlorophenol

Carbamate Pesticides

2-Isopropoxyphenol
Carbofuranphenol

Polychlorinated Dibenzo-p-dioxins, Dibenzofurans, Coplanar and Mono-Ortho-Substituted Biphenyls

1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin (OCDD)
1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin (HpCDD)
1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin (HxCDD)
1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin (HxCDD)
1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin (HxCDD)
1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin (PeCDD)
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD)
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)
2,3,7,8-Tetrachlorodibenzofuran (TCDF)
2,4,4'-Trichlorobiphenyl (PCB 28)*
2,3',4,4'-Tetrachlorobiphenyl (PCB 66)
2,4,4',5-Tetrachlorobiphenyl (PCB 74)
3,4,4',5-Tetrachlorobiphenyl (PCB 81)
2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)
3,3',4,4',5-Pentachlorobiphenyl (PCB 126)
2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)
2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)
3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)
2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)

Non-dioxin-like Polychlorinated Biphenyls

2,2',5,5'-Tetrachlorobiphenyl (PCB 52)
2,2',3,4,5'-Pentachlorobiphenyl (PCB 87)
2,2',4,4',5-Pentachlorobiphenyl (PCB 99)
2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)
2,3,3',4',6-Pentachlorobiphenyl (PCB 110)
2,2',3,3',4,4'-Hexachlorobiphenyl (PCB 128)
2,2',3,4,4',5' and 2,3,3',4,4',6-Hexachlorobiphenyl (PCB 138 & 158)
2,2',3,4',5,5'-Hexachlorobiphenyl (PCB 146)
2,2',3,4',5',6'-Hexachlorobiphenyl (PCB 149)
2,2',3,5,5',6-Hexachlorobiphenyl (PCB 151)
2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)
2,2',3,3',4,4',5-Heptachlorobiphenyl (PCB 170)
2,2',3,3',4,5,5'-Heptachlorobiphenyl (PCB 172)
2,2',3,3',4,5',6'-Heptachlorobiphenyl (PCB 177)
2,2',3,3',5,5',6-Heptachlorobiphenyl (PCB 178)
2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)
2,2',3,4,4',5',6-Heptachlorobiphenyl (PCB 183)
2,2',3,4',5,5',6-Heptachlorobiphenyl (PCB 187)
2,2',3,3',4,4',5,5'-Octachlorobiphenyl (PCB 194)
2,2',3,3',4,4',5,6-Octachlorobiphenyl (PCB 195)
2,2',3,3',4,4',5,6' and 2,2',3,4,4',5,5',6-Octachlorobiphenyl (PCB 196 & 203)
2,2',3,3',4,5,5',6-Octachlorobiphenyl (PCB 199)
2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl (PCB 206)

* Results available for 1999-2000 only.

95th Percentiles for Blood and Urine Levels of Chemicals Measured in the *Report*

The data summarized here provide 95th percentile levels for these 148 chemicals by age, sex, and race or ethnicity in NHANES 2001-2002. Scientists can use 95th percentile levels to determine which serum, blood, or urine levels of exposure are common to people in the U.S. population and which levels are unusual. Confidence intervals and corresponding sample sizes for the 95th percentiles presented here can be found in the full version of the *Report*.

Cadmium

			Age (in years)				Gender		Race/Ethnicity		
Chemical	Units	**Total Population**	1-5	6-11	12-19	20 and older	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Cadmium in blood	µg/dL	**1.30**	.300	.400	.800	1.60	1.40	1.40	1.00	1.40	1.40

			Age (in years)			Gender		Race/Ethnicity		
Chemical	Units	**Total Population**	6-11	12-19	20-59	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Cadmium in urine	µg/L	**1.20**	.282	.442	1.28	1.22	1.17	.766	1.51	1.17
	µg/g of creatinine	**.917**	.291	.280	.979	.757	.985	.693	.917	.931

Lead

			Age (in years)				Gender		Race/Ethnicity		
Chemical	Units	**Total Population**	1-5	6-11	12-19	20 and older	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Lead in blood	µg/dL	**4.40**	5.80	3.70	2.70	4.60	5.30	3.60	5.40	5.70	4.10

			Age (in years)			Gender		Race/Ethnicity		
Chemical	Units	**Total Population**	6-11	12-19	20 and older	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Lead in urine	µg/L	**2.60**	2.60	1.90	2.80	3.20	2.20	3.20	3.70	2.40
	µg/g of creatinine	**2.03**	3.64	1.41	2.00	2.06	1.98	2.78	2.75	1.88

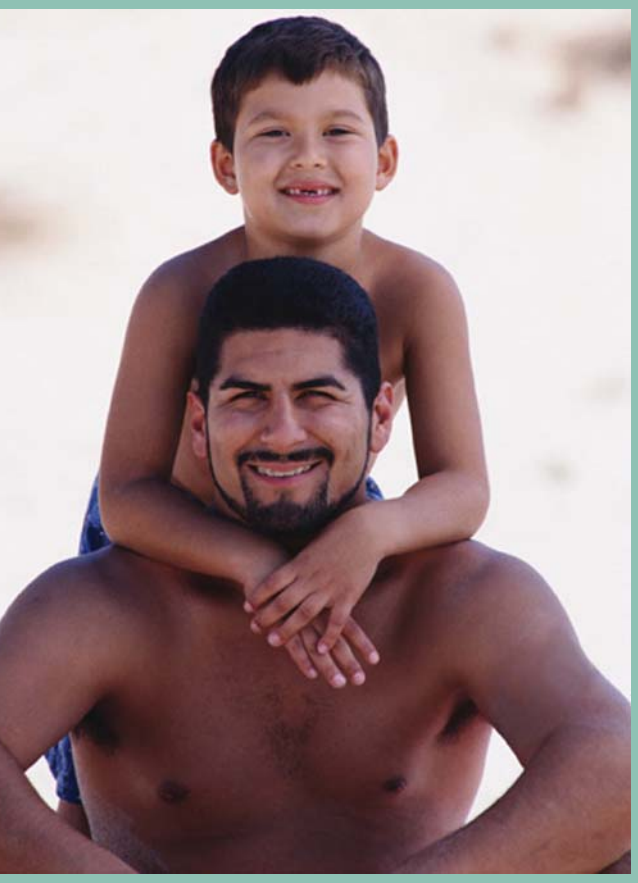
Mercury

			Gender	
Chemical	Units	**Total Population**	Male	Female
Mercury in blood				
1-5 years	µg/L	**1.90**	2.60	1.70

		Gender	Race/Ethnicity		
Chemical	Units	**Female**	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Mercury in blood					
16-49 years	µg/L	**4.60**	3.50	4.10	4.60

		Gender	Race/Ethnicity		
Chemical	Units	**Female**	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Mercury in urine					
16-49 years	µg/L	**3.99**	4.13	5.18	3.62
	µg/g of creatinine	**3.00**	3.21	3.21	2.95

				Age (in years)			Gender		Race/Ethnicity		
Chemical	Blood Urine Serum	Units	**Total Population**	6-11	12-19	20 and older	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Other Metals											
Antimony	urine	µg/L	**.340**	.330	.460	.330	.390	.310	.360	.450	.340
	urine	µg/g of creatinine	**.364**	.469	.266	.364	.333	.371	.338	.300	.380
Barium	urine	µg/L	**7.48**	6.88	9.00	7.14	7.87	7.15	6.08	5.99	7.70
	urine	µg/g of creatinine	**6.24**	6.71	5.55	6.55	5.42	6.97	4.95	3.96	6.71
Beryllium	urine	µg/L	**< LOD**	< LOD	.140	< LOD	.130	< LOD	< LOD	< LOD	< LOD
	urine	µg/g of creatinine	**< LOD**	< LOD	.231	< LOD	.281	< LOD	< LOD	< LOD	< LOD
Cesium	urine	µg/L	**12.6**	11.1	12.0	12.8	12.8	12.4	11.3	10.7	12.6
	urine	µg/g of creatinine	**10.2**	11.9	8.05	10.2	9.46	10.3	10.0	6.75	10.3
Cobalt	urine	µg/L	**1.27**	1.28	1.59	1.15	1.05	1.44	1.20	1.75	1.16
	urine	µg/g of creatinine	**1.15**	1.30	1.06	1.15	.848	1.29	1.10	1.03	1.16
Molybdenum	urine	µg/L	**165**	197	179	150	169	158	177	166	152
	urine	µg/g of creatinine	**130**	185	106	122	123	136	129	109	138
Platinum	urine	µg/L	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	urine	µg/g of creatinine	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Thallium	urine	µg/L	**.440**	.380	.460	.440	.420	.430	.400	.520	.430
	urine	µg/g of creatinine	**.348**	.411	.307	.342	.307	.375	.361	.321	.347
Tungsten	urine	µg/L	**.450**	.770	.570	.370	.490	.430	.560	.460	.430
	urine	µg/g of creatinine	**.359**	.634	.359	.321	.364	.353	.554	.340	.353
Uranium	urine	µg/L	**.046**	.037	.041	.046	.046	.040	.054	.030	.036
	urine	µg/g of creatinine	**.040**	.033	.026	.043	.033	.045	.049	.017	.034



				Age (in years)			Gender		Race/Ethnicity		
Chemical	Blood Urine Serum	Units	**Total Population**	3-11	12-19	20 and older	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Tobacco Smoke											
Cotinine	serum	ng/mL	**2.19**	3.21	3.12	1.38	2.44	1.76	2.11	3.12	1.88

				Age (in years)			Gender		Race/Ethnicity		
Chemical	Blood Urine Serum	Units	**Total Population**	6-11	12-19	20 and older	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Polycyclic Aromatic Hydrocarbons											
1-Hydroxybenz[a]anthracene	urine	ng/L	**30.0**	45.0	38.0	26.0	30.0	30.0	21.0	59.0	27.0
	urine	ng/g of creatinine	**27.0**	34.0	28.0	24.5	24.8	27.0	21.5	33.9	28.0
3- and 9-Hydroxybenz[a]anthracene	urine	ng/L	**24.0**	14.0	28.0	23.0	25.0	21.0	23.0	35.0	23.0
	urine	ng/g of creatinine	**31.8**	29.6	29.1	32.3	26.3	33.8	32.3	28.4	33.8
1-Hydroxybenzo[c]phenanthrene	urine	ng/L	**34.0**	15.0	29.0	37.0	19.0	51.0	52.0	21.0	35.0
	urine	ng/g of creatinine	**41.3**	28.3	21.5	45.9	18.7	69.6	42.0	14.0	45.7
2-Hydroxybenzo[c]phenanthrene	urine	ng/L	**13.0**	< LOD	< LOD	16.0	13.0	13.0	15.0	18.0	15.0
	urine	ng/g of creatinine	**20.3**	< LOD	< LOD	21.4	17.5	21.9	23.3	13.2	21.9
3-Hydroxybenzo[c]phenanthrene	urine	ng/L	**11.0**	13.0	12.0	11.0	11.0	12.0	14.0	14.0	11.0
	urine	ng/g of creatinine	**15.9**	14.6	13.1	15.9	12.5	16.7	17.5	13.4	15.9
1-Hydroxychrysene	urine	ng/L	**105**	69.0	71.0	116	107	92.0	104	135	105
	urine	ng/g of creatinine	**89.2**	58.1	49.3	103	86.4	91.5	108	106	91.5
2-Hydroxychrysene	urine	ng/L	**31.0**	39.0	32.0	32.0	34.0	31.0	15.0	43.0	27.0
	urine	ng/g of creatinine	**27.8**	29.9	24.1	27.8	26.3	30.2	21.8	30.8	27.1
3-Hydroxychrysene	urine	ng/L	**42.0**	42.0	37.0	43.0	45.0	35.0	30.0	43.0	44.0
	urine	ng/g of creatinine	**56.8**	67.3	43.8	57.8	47.6	65.0	42.0	35.0	61.8
4-Hydroxychrysene	urine	ng/L	**< LOD**	5.00	< LOD	< LOD	< LOD	< LOD	< LOD	13.0	< LOD
	urine	ng/g of creatinine	**< LOD**	9.55	< LOD	< LOD	< LOD	< LOD	< LOD	9.00	< LOD
6-Hydroxychrysene	urine	ng/L	**77.0**	68.0	79.0	77.0	101	59.0	84.0	112	73.0
	urine	ng/g of creatinine	**61.5**	80.6	62.7	60.7	64.4	50.8	75.0	68.8	62.4
2-Hydroxyfluorene	urine	ng/L	**2820**	979	2190	3140	3210	2310	1350	3480	2920
	urine	ng/g of creatinine	**1890**	1040	1170	2080	1900	1890	1350	1880	2080
3-Hydroxyfluorene	urine	ng/L	**1620**	377	1210	1840	1810	1390	668	2350	1610
	urine	ng/g of creatinine	**1060**	382	700	1210	1130	1030	598	1240	1150
9-Hydroxyfluorene	urine	ng/L	**1090**	720	883	1150	1240	1020	1080	1570	1060
	urine	ng/g of creatinine	**852**	740	642	933	843	894	724	1190	896
1-Hydroxyphenanthrene	urine	ng/L	**684**	493	579	712	713	654	514	713	649
	urine	ng/g of creatinine	**464**	452	354	476	450	473	396	384	476
2-Hydroxyphenanthrene	urine	ng/L	**332**	257	281	342	359	292	303	374	333
	urine	ng/g of creatinine	**231**	234	173	241	245	213	242	251	231
3-Hydroxyphenanthrene	urine	ng/L	**649**	412	447	683	734	518	454	957	649
	urine	ng/g of creatinine	**428**	408	275	488	505	410	333	589	447
4-Hydroxyphenanthrene	urine	ng/L	**280**	250	306	292	287	278	289	277	287
	urine	ng/g of creatinine	**347**	314	236	371	282	418	323	230	387
9-Hydroxyphenanthrene	urine	ng/L	**343**	124	250	392	381	337	202	399	344
	urine	ng/g of creatinine	**240**	120	158	268	218	271	166	233	268
1-Hydroxypyrene	urine	ng/L	**349**	272	329	361	416	278	269	442	343
	urine	ng/g of creatinine	**243**	320	233	233	249	218	208	231	245
3-Hydroxybenzo[a]pyrene	urine	ng/L	**179**	139	139	206	167	206	253	136	167
	urine	ng/g of creatinine	**184**	207	103	186	167	198	225	116	190
1-Hydroxynapthalene	urine	ng/L	**22300**	12400	21400	23300	21500	22300	11900	24700	22300
	urine	ng/g of creatinine	**17800**	12900	11200	18600	14200	20500	10300	18900	17300
2-Hydroxynapthalene	urine	ng/L	**26000**	7720	22500	28100	28100	25100	13600	33000	25900
	urine	ng/g of creatinine	**16700**	6490	10900	17700	15800	17400	12000	17400	16900

				Age (in years)	Gender		Race/Ethnicity		
Chemical	Blood Urine Serum	Units	**Total Population**	20 and older	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Polychlorinated dibenzo-*p*-dioxins									
1,2,3,4,6,7,8,9-Octachlorodibenzo-*p*-dioxin (OCDD)	serum	pg/g of lipid	**1260**	1260	1030	1450	1150	1640	1290
	serum	fg/g of serum	**9110**	9110	7410	9460	8050	9460	9120
1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin (HpCDD)	serum	pg/g of lipid	**147**	147	138	157	148	166	147
	serum	fg/g of serum	**1030**	1030	983	1140	988	1160	1020
1,2,3,4,7,8-Hexachlorodibenzo-*p*-dioxin (HxCDD)	serum	pg/g of lipid	**14.9**	14.9	14.7	14.9	9.20	18.3	15.1
	serum	fg/g of serum	**105**	105	105	102	70.2	125	105
1,2,3,6,7,8-Hexachlorodibenzo-*p*-dioxin (HxCDD)	serum	pg/g of lipid	**127**	127	128	126	67.9	133	130
	serum	fg/g of serum	**870**	870	883	863	524	799	897
1,2,3,7,8,9-Hexachlorodibenzo-*p*-dioxin (HxCDD)	serum	pg/g of lipid	**16.9**	16.9	14.8	18.3	12.1	19.9	17.2
	serum	fg/g of serum	**121**	121	108	123	104	123	124
1,2,3,7,8-Pentachlorodibenzo-*p*-dioxin (PeCDD)	serum	pg/g of lipid	**15.8**	15.8	14.3	16.4	8.70	18.4	16.7
	serum	fg/g of serum	**117**	117	107	121	66.0	123	119
2,3,7,8-Tetrachlorodibenzo-*p*-dioxin (TCDD)	serum	pg/g of lipid	**< LOD**	< LOD	< LOD	6.40	< LOD	7.40	< LOD
	serum	fg/g of serum	**< LOD**	< LOD	< LOD	50.7	< LOD	52.1	< LOD
Polychlorinated dibenzofurans									
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	serum	pg/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	fg/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	serum	pg/g of lipid	**27.1**	27.1	28.9	26.5	20.2	32.1	25.5
	serum	fg/g of serum	**181**	181	181	169	133	192	180
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	serum	pg/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	fg/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	serum	pg/g of lipid	**15.4**	15.4	15.9	14.1	8.00	18.6	15.9
	serum	fg/g of serum	**108**	108	108	104	65.3	122	112
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	serum	pg/g of lipid	**14.0**	14.0	14.8	13.1	6.80	15.6	14.8
	serum	fg/g of serum	**101**	101	104	90.2	52.7	107	103
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	serum	pg/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	fg/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	serum	pg/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	fg/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,3,4,6,7,8-Hexchlorodibenzofuran (HxCDF)	serum	pg/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	fg/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	serum	pg/g of lipid	**18.0**	18.0	16.7	18.5	9.80	18.9	18.4
	serum	fg/g of serum	**134**	134	135	126	76.3	121	135
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	serum	pg/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	fg/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD

				Age (in years)	Gender		Race/Ethnicity		
Chemical	Blood Urine Serum	Units	**Total Population**	20 and older	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Coplanar polychlorinated biphenyls									
3,4,4',5-Tetrachlorobiphenyl (PCB 81)	serum	pg/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	fg/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	serum	pg/g of lipid	**108**	108	81.9	116	69.2	115	114
	serum	fg/g of serum	**730**	730	566	818	585	779	746
3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	serum	pg/g of lipid	**60.7**	60.7	60.6	60.9	32.3	54.8	64.3
	serum	fg/g of serum	**416**	416	446	391	262	361	438

				Age (in years)		Gender		Race/Ethnicity		
Chemical	Blood Urine Serum	Units	**Total Population**	12-19	20 and older	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Mono-ortho-substituted polychlorinated biphenyls										
2,3',4,4'-Tetrachlorobiphenyl (PCB 66)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,4,4',5-Tetrachlorobiphenyl (PCB 74)	serum	ng/g of lipid	**32.6**	< LOD	34.8	28.5	35.9	19.6	31.5	35.5
	serum	ng/g of serum	**.212**	< LOD	.226	.189	.236	.144	.192	.229
2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	serum	ng/g of lipid	**44.6**	< LOD	46.4	32.7	48.7	26.4	54.9	45.3
	serum	ng/g of serum	**.293**	< LOD	.310	.208	.356	.180	.322	.301
2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	serum	ng/g of lipid	**18.2**	< LOD	19.7	18.2	18.1	< LOD	23.5	19.3
	serum	ng/g of serum	**.126**	< LOD	.132	.123	.134	< LOD	.144	.131
2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD

				Age (in years)		Gender		Race/Ethnicity		
Chemical	Blood Urine Serum	Units	**Total Population**	12-19	20 and older	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Non-dioxin-like Polychlorinated Biphenyls										
2,2',5,5'-Tetrachlorobiphenyl (PCB 52)	serum	ng/g of lipid	**16.2**	22.9	16.0	16.0	16.5	16.9	16.1	16.5
	serum	ng/g of serum	**.089**	.104	.086	.085	.088	.083	.092	.088
2,2',3,4,5'-Pentachlorobiphenyl (PCB 87)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,2',4,4',5-Pentachlorobiphenyl (PCB 99)	serum	ng/g of lipid	**26.3**	< LOD	28.8	24.9	28.5	13.4	28.8	28.5
	serum	ng/g of serum	**.183**	< LOD	.193	.161	.200	.100	.187	.187
2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,3,3',4',6-Pentachlorobiphenyl (PCB 110)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,2',3,3',4,4'-Hexachlorobiphenyl (PCB 128)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,2',3,4,4',5'-Hexachlorobiphenyl (PCB 138 & 158)	serum	ng/g of lipid	**94.6**	23.1	99.5	94.5	93.9	51.6	122	96.1
	serum	ng/g of serum	**.649**	.113	.676	.627	.656	.349	.764	.647
2,2',3,4',5,5'-Hexachlorobiphenyl (PCB 146)	serum	ng/g of lipid	**15.3**	< LOD	16.5	15.3	15.2	< LOD	23.8	15.2
	serum	ng/g of serum	**.104**	< LOD	.112	.102	.112	< LOD	.148	.100
2,2',3,4',5',6'-Hexachlorobiphenyl (PCB 149)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,2',3,5,5',6-Hexachlorobiphenyl (PCB 151)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)	serum	ng/g of lipid	**126**	30.3	132	124	126	66.7	170	126
	serum	ng/g of serum	**.851**	.147	.898	.851	.860	.466	1.04	.838
2,2',3,3',4,4',5-Heptachlorobiphenyl (PCB 170)	serum	ng/g of lipid	**35.0**	< LOD	36.8	36.1	34.0	21.1	44.1	35.0
	serum	ng/g of serum	**.246**	< LOD	.254	.245	.245	.154	.276	.247
2,2',3,3',4,5,5'-Heptachlorobiphenyl (PCB 172)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,2',3,3',4,5',6'-Heptachlorobiphenyl (PCB 177)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	10.6	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	.064	< LOD
2,2',3,3',5,5',6-Heptachlorobiphenyl (PCB 178)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)	serum	ng/g of lipid	**87.0**	21.3	90.7	86.9	87.9	54.2	116	87.9
	serum	ng/g of serum	**.605**	.092	.637	.616	.604	.353	.719	.617
2,2',3,4,4',5',6-Heptachlorobiphenyl (PCB 183)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	12.7	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	.082	< LOD
2,2',3,4',5,5',6-Heptachlorobiphenyl (PCB 187)	serum	ng/g of lipid	**27.9**	< LOD	29.2	27.7	28.5	15.7	43.5	27.4
	serum	ng/g of serum	**.198**	< LOD	.210	.187	.202	.104	.286	.191
2,2',3,3',4,4',5,5'-Octachlorobiphenyl (PCB 194)	serum	ng/g of lipid	**23.7**	< LOD	25.3	25.2	21.7	13.9	29.8	24.1
	serum	ng/g of serum	**.162**	< LOD	.174	.169	.147	.099	.195	.165
2,2',3,3',4,4',5,6-Octachlorobiphenyl (PCB 195)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,2',3,3',4,4',5,6' and 2,2',3,4,4',5,5',6-Octachlorobiphenyl (PCB 196 & 203)	serum	ng/g of lipid	**19.2**	< LOD	19.9	19.4	19.0	11.1	22.8	19.5
	serum	ng/g of serum	**.127**	< LOD	.133	.126	.126	.071	.148	.131
2,2',3,3',4,5,5',6-Octachlorobiphenyl (PCB 199)	serum	ng/g of lipid	**22.4**	< LOD	24.4	21.2	22.7	12.1	30.7	22.6
	serum	ng/g of serum	**.151**	< LOD	.158	.150	.151	.087	.182	.150
2,2',3,3',4,4',5,5',6'-Nonachlorobiphenyl (PCB 206)	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD

				Age (in years)			Gender		Race/Ethnicity		
Chemical	Blood Urine Serum	Units	**Total Population**	6-11	12-19	20 and older	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Phthalates											
Mono-methyl phthalate	urine	µg/L	**9.80**	11.6	12.7	9.10	9.10	10.3	8.30	10.8	9.70
	urine	µg/g of creatinine	**7.97**	12.5	7.27	7.72	6.42	10.0	7.53	8.02	8.29
Mono-ethyl phthalate	urine	µg/L	**2500**	808	2060	2720	3050	1840	2590	3540	2310
	urine	µg/g of creatinine	**1860**	837	1330	2080	2080	1430	1900	2070	1590
Mono-n-butyl phthalates	urine	µg/L	**108**	157	147	95.4	95.2	120	112	138	107
	urine	µg/g of creatinine	**81.3**	146	88.6	71.6	60.0	91.5	86.7	85.6	81.4
Mono-isobutyl phthalate	urine	µg/L	**17.9**	23.4	22.2	16.3	16.6	18.7	18.3	25.4	15.6
	urine	µg/g of creatinine	**12.0**	24.3	12.8	10.6	10.9	13.5	16.0	15.6	10.7
Mono-benzyl phthalate	urine	µg/L	**122**	226	169	99.7	122	122	91.6	139	121
	urine	µg/g of creatinine	**90.4**	195	99.7	64.9	80.3	95.8	72.0	101	89.2
Mono-cyclohexyl phthalate	urine	µg/L	**.400**	.600	.500	.500	.500	.500	.500	.400	.500
	urine	µg/g of creatinine	**.854**	.909	.769	.870	.800	.870	.882	.588	.870
Mono-2-ethylhexyl phthalate	urine	µg/L	**38.9**	29.9	42.5	39.5	37.9	42.5	28.4	52.1	37.9
	urine	µg/g of creatinine	**32.8**	31.2	25.2	33.3	31.2	35.1	24.5	39.8	32.8
Mono-(2-ethyl-5-oxohexyl) phthalate	urine	µg/L	**120**	142	118	115	129	115	76.5	148	126
	urine	µg/g of creatinine	**87.5**	130	70.5	84.3	83.1	92.3	65.8	101	96.0
Mono-(2-ethyl-5-hydroxyhexyl) phthalate	urine	µg/L	**192**	210	202	175	212	170	123	276	212
	urine	µg/g of creatinine	**147**	211	102	134	136	160	106	161	178
Mono-(3-carboxypropyl) phthalate	urine	µg/L	**14.6**	24.7	13.9	12.0	14.2	14.7	13.6	14.9	15.8
	urine	µg/g of creatinine	**11.4**	26.4	9.44	7.71	11.6	11.1	11.2	10.0	11.8
Mono-n-octyl phthalate	urine	µg/L	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	urine	µg/g of creatinine	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Mono-isononyl phthalate	urine	µg/L	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	1.00	1.00	< LOD
	urine	µg/g of creatinine	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	2.31	1.62	< LOD
Phytoestrogens											
Daidzein	urine	µg/L	**1250**	1030	1360	1210	906	1470	896	1400	1140
	urine	µg/g of creatinine	**957**	930	1030	939	788	1180	722	939	957
Enterodiol	urine	µg/L	**252**	201	238	254	263	245	244	218	254
	urine	µg/g of creatinine	**224**	304	152	223	212	225	223	157	224
Enterolactone	urine	µg/L	**2720**	2160	2180	2840	3050	2200	2280	1960	2780
	urine	µg/g of creatinine	**2120**	1970	1490	2180	1940	2150	1610	1490	2410
Equol	urine	µg/L	**72.2**	85.4	64.4	73.5	61.7	79.8	42.4	45.7	74.4
	urine	µg/g of creatinine	**62.6**	88.2	50.6	58.7	54.3	77.1	40.6	35.3	67.0
Genistein	urine	µg/L	**613**	502	467	627	470	666	424	596	626
	urine	µg/g of creatinine	**427**	487	321	435	350	571	371	384	426
O-Desmethylangolensin	urine	µg/L	**260**	281	249	259	194	394	152	303	260
	urine	µg/g of creatinine	**289**	305	259	289	151	421	113	207	301



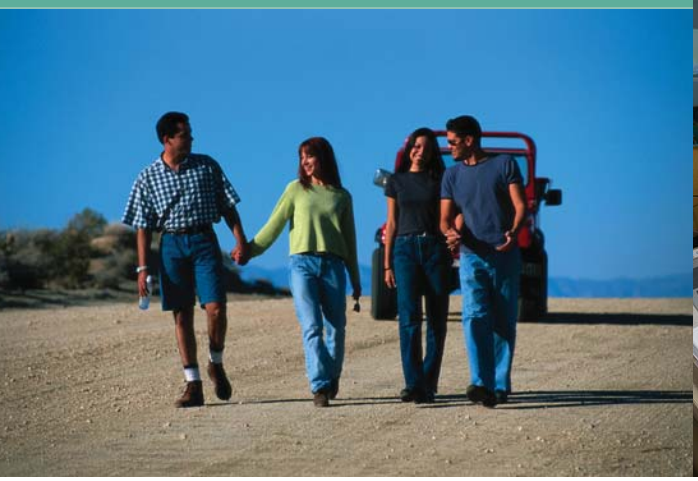





				Age (in years)		Gender		Race/Ethnicity		
Chemical	Blood Urine Serum	Units	**Total Population**	12-19	20 and older	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Organochlorine Pesticides										
Hexachlorobenzene	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Beta-hexachlorocyclohexane	serum	ng/g of lipid	**43.3**	8.44	46.2	29.2	54.5	84.4	45.9	33.5
	serum	ng/g of serum	**.296**	.048	.312	.200	.368	.612	.226	.220
Gamma-hexachlorocyclohexane	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
p,p'-DDT	serum	ng/g of lipid	**26.5**	< LOD	28.1	21.6	36.3	236	40.9	17.7
	serum	ng/g of serum	**.184**	< LOD	.201	.153	.239	1.56	.229	.125
p,p'-DDE	serum	ng/g of lipid	**2320**	456	2550	1900	2630	7030	3260	1640
	serum	ng/g of serum	**15.4**	2.30	16.8	13.1	16.8	40.9	19.3	11.3
o,p' -DDT	serum	ng/g of lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Oxychlordane	serum	ng/g of lipid	**49.7**	11.4	53.1	48.1	52.5	37.9	55.3	50.8
	serum	ng/g of serum	**.352**	.058	.370	.319	.365	.278	.349	.365
trans-Nonachlor	serum	ng/g lipid	**78.2**	18.9	84.9	77.2	76.8	59.8	112	78.5
	serum	ng/g of serum	**.589**	.093	.642	.579	.589	.465	.680	.596
Heptachlor Epoxide	serum	ng/g lipid	**21.6**	< LOD	23.1	20.8	23.2	16.6	21.0	22.8
	serum	ng/g of serum	**.153**	< LOD	.166	.148	.166	.114	.129	.165
Mirex	serum	ng/g lipid	**57.1**	< LOD	71.0	50.8	63.0	< LOD	153	66.7
		ng/g of serum	**.414**	< LOD	.468	.368	.419	< LOD	.826	.449
Aldrin	serum	ng/g lipid	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	serum	ng/g of serum	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Dieldrin	serum	ng/g lipid	**20.3**	< LOD	21.3	20.2	19.8	15.4	20.2	20.7
	serum	ng/g of serum	**.146**	< LOD	.158	.156	.141	.119	.118	.153
Endrin	serum	ng/g lipid	**5.10**	5.60	< LOD	5.20	< LOD	5.20	5.30	5.10
	serum	ng/g of serum	**.021**	.021	< LOD	.020	< LOD	.021	.021	.021

				Age (in years)			Gender		Race/Ethnicity		
Chemical	Blood Urine Serum	Units	**Total Population**	6-11	12-19	20-59	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Organochlorine Pesticides											
Pentachlorophenol	urine	µg/L	**1.94**	2.08	2.30	1.86	1.94	1.92	1.60	2.75	1.91
	urine	µg/g creatinine	**2.26**	3.18	1.82	2.06	1.73	2.69	1.94	1.94	2.10
2,4,5-Trichlorophenol	urine	µg/L	**2.31**	2.42	1.90	2.71	5.57	< LOD	14.2	2.31	2.42
	urine	µg/g creatinine	**4.57**	5.64	2.67	4.57	4.31	< LOD	11.9	2.81	4.31
2,4,6-Trichlorophenol	urine	µg/L	**14.9**	19.2	19.4	13.2	17.0	13.1	15.6	17.9	14.6
	urine	µg/g creatinine	**11.6**	21.2	12.3	9.77	12.2	10.9	11.6	9.87	12.0

				Age (in years)			Gender		Race/Ethnicity		
Chemical	Blood Urine Serum	Units	**Total Population**	6-11	12-19	20-59	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Organophosphate Pesticides: Dialkyl Phosphate Metabolites											
Dimethylphosphate	urine	µg/L	**13.4**	18.2	14.6	11.5	12.6	13.7	14.4	19.4	12.3
	urine	µg/g of creatinine	**12.7**	20.6	9.70	11.5	10.5	15.0	14.6	13.2	12.9
Dimethylthiophosphate	urine	µg/L	**32.6**	45.7	33.9	29.5	30.4	34.3	35.2	42.2	32.6
	urine	µg/g of creatinine	**27.2**	47.2	22.4	25.2	24.0	29.6	30.2	22.6	27.4
Dimethyldithiophosphate	urine	µg/L	**4.95**	7.33	4.63	4.90	5.13	5.10	4.47	4.38	5.74
	urine	µg/g of creatinine	**5.80**	6.98	3.13	6.03	4.43	6.93	4.86	3.65	6.98
Diethylphosphate	urine	µg/L	**11.4**	20.0	11.0	10.4	11.5	10.4	11.2	15.4	10.0
	urine	µg/g of creatinine	**8.53**	17.0	7.16	7.31	6.88	9.57	7.66	9.75	7.80
Diethylthiophosphate	urine	µg/L	**3.94**	4.08	4.08	3.79	3.83	3.91	3.98	5.27	3.73
	urine	µg/g of creatinine	**4.61**	5.70	3.14	4.61	3.31	6.57	3.67	3.89	5.77
Diethyldithiophosphate	urine	µg/L	**.830**	.940	.820	.830	.770	.990	1.12	.820	.810
	urine	µg/g of creatinine	**1.01**	1.36	.667	1.03	.740	1.24	1.29	.723	1.03
Organophosphate Pesticides: Specific Metabolites											
para-Nitrophenol	urine	µg/L	**3.70**	3.90	3.34	3.72	4.00	3.46	3.85	5.60	3.70
	urine	µg/g of creatinine	**2.89**	3.67	2.09	2.89	2.97	2.81	3.04	2.97	2.93
3,5,6-Trichloro-2-pyridinol	urine	µg/L	**12.4**	14.9	18.0	10.9	14.9	10.4	12.2	12.3	12.3
	urine	µg/g of creatinine	**9.22**	16.9	10.3	7.44	10.3	8.98	9.00	7.06	9.98
2-Isopropyl-4-methyl-6-hydroxypyrimidine	urine	µg/L	**< LOD**	1.45	< LOD	< LOD	< LOD	< LOD	< LOD	1.35	< LOD
	urine	µg/g of creatinine	**< LOD**	2.58	< LOD	< LOD	< LOD	< LOD	< LOD	1.76	< LOD
2-(Diethylamino)-6-methylpyrimidin-4-ol/one	urine	µg/L	**.470**	.820	.610	.430	.840	.200	.400	< LOD	.490
	urine	µg/g of creatinine	**.778**	1.17	.667	.764	.732	.778	.778	< LOD	.778
3-Chloro-7-hydroxy-4-methyl-2H-chromen-2-one/ol	urine	µg/L	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	.200	< LOD
	urine	µg/g of creatinine	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	.373	< LOD
Herbicides											
2,4,5-Trichlorophenoxyacetic acid	urine	µg/L	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	urine	µg/g of creatinine	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
2,4-Dichlorophenoxyacetic acid	urine	µg/L	**1.27**	1.55	1.24	1.27	1.51	.890	1.18	1.06	1.32
	urine	µg/g of creatinine	**1.08**	1.40	.662	1.04	1.14	1.06	1.10	.778	1.14
2,4-Dichlorophenol	urine	µg/L	**23.9**	27.8	25.9	24.0	23.9	24.5	40.1	74.5	15.0
	urine	µg/g of creatinine	**18.0**	26.4	17.7	17.2	15.6	19.1	41.5	53.3	11.0
Atrazine mercapturate	urine	µg/L	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	urine	µg/g of creatinine	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Acetochlor mercapturate	urine	µg/L	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	urine	µg/g of creatinine	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Metolachlor mercapturate	urine	µg/L	**< LOD**	< LOD	< LOD	< LOD	.200	< LOD	< LOD	< LOD	< LOD
	urine	µg/g of creatinine	**< LOD**	< LOD	< LOD	< LOD	.424	< LOD	< LOD	< LOD	< LOD



				Age (in years)			Gender		Race/Ethnicity		
Chemical	Blood Urine Serum	Units	**Total Population**	6-11	12-19	20-59	Male	Female	Mexican Americans	Non-Hispanic Blacks	Non-Hispanic Whites
Pyrethroid Pesticides											
4-Fluoro-3-phenoxybenzoic acid	urine	µg/L	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	urine	µg/g of creatinine	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
cis-3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid	urine	µg/L	**.890**	.730	.720	.960	.880	.880	.510	.840	.890
	urine	µg/g of creatinine	**.778**	.745	.500	.891	.675	.920	.535	.837	.837
trans-3-(2,2-Dichlorovinyl)-2,2-dimethylcyclopropane carboxylic acid	urine	µg/L	**2.50**	2.50	1.94	2.56	2.37	2.56	1.59	1.94	2.60
	urine	µg/g of creatinine	**2.55**	2.80	1.56	2.47	2.20	2.81	1.87	1.98	2.48
cis-3-(2,2-Dibromovinyl)-2,2-dimethylcyclopropane carboxylic acid	urine	µg/L	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	urine	µg/g of creatinine	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
3-Phenoxybenzoic acid	urine	µg/L	**3.32**	3.28	3.45	3.25	3.23	3.28	2.71	3.25	3.38
	urine	µg/g of creatinine	**3.10**	3.32	2.35	3.10	2.75	3.34	1.83	2.82	3.43
Other Pesticides											
N,N-diethyl-3-methylbenzamide	urine	µg/L	**.170**	.200	.220	.160	.180	.160	.120	.130	.170
	urine	µg/g of creatinine	**.412**	.632	.241	.407	.314	.500	.280	.187	.481
ortho-Phenylphenol	urine	µg/L	**1.27**	2.28	2.05	.930	1.27	1.22	2.92	1.19	1.07
	urine	µg/g of creatinine	**1.75**	2.53	1.52	1.44	1.61	1.75	3.00	1.16	1.52
2,5-Dichlorophenol	urine	µg/L	**657**	683	733	641	663	624	1550	2520	194
	urine	µg/g of creatinine	**527**	729	541	514	500	589	1500	2030	131
Carbamate Pesticides											
2-Isopropoxyphenol	urine	µg/L	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	urine	µg/g of creatinine	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
Carbofuranphenol	urine	µg/L	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD
	urine	µg/g of creatinine	**< LOD**	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD	< LOD

Selection of Chemicals Included in the *Report*

Chemicals for which data were collected and information presented in the *Report* were selected on the basis of scientific data that suggested exposure in the U.S. population; the seriousness of health effects known or suspected to result from exposure; the need to assess the efficacy of public health actions to reduce exposure to a chemical; the availability of a biomonitoring analytical method with adequate accuracy, precision, sensitivity, specificity, and speed; the availability of sufficient quantity of blood or urine samples; and the cost of analysis for the chemical.

In October 2002, CDC solicited nominations from the public for candidate chemicals or categories of chemicals for possible inclusion in future *Reports* (*Federal Register*, Vol. 67, No. 194, October 7, 2002) and received nominations for hundreds of chemicals. Details on the nomination process and the list of the nominated chemicals are available at www.cdc.gov/exposurereport/chemical_nominations.htm.

Future Plans

CDC plans to release future *Reports* of exposure of the U.S. population that cover 2-year periods (e.g., 2003-2004, 2005-2006, and 2007-2008). These *Reports* will include more chemicals and additional information on exposure in population groups defined by age, sex, and race or ethnicity.














For more information or additional copies of this document please contact:
Centers for Disease Control and Prevention
National Center for Environmental Health
Division of Laboratory Sciences
Mail Stop F-20
4770 Buford Highway, NE
Atlanta, Georgia 30341-3724
Telephone (toll-free): 1-866-670-6052
E-mail: ncehdls@cdc.gov
Web site: www.cdc.gov/exposurereport

NCEH Pub#: 05-0725