

National Health and Nutrition Examination Survey

2001-2002 Data Documentation, Codebook, and Frequencies

Non-dioxin-like Polychlorinated Biphenyls - Pooled Samples (Surplus Sera) (SSPCB_B)

Data File: SSPCB_B.xpt

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Component Description

Polychlorinated biphenyls (PCBs) are a class of chlorinated aromatic hydrocarbon chemicals that once were used as heat-exchanger, transformer, and hydraulic fluids, and as additives to paints, oils, joint caulking, and floor tiles. The different types of PCBs are known as congeners, which are compounds that are distinguished by the number of chlorine atoms and their location on the biphenyl structure. Peak production occurred in the early 1970s, and production was banned in the U.S. after 1979. More than 1.5 million pounds of PCBs were manufactured in the U.S. prior to 1977. Concern about these chemicals continues because of their persistence in the environment and accumulation in wildlife and the animal food chain. PCBs enter the food chain by various routes, including migration into food from external sources, contamination of animal feeds, and accumulation in the fatty tissues of animals. PCBs are found at higher concentrations in fatty foods, (e.g., dairy products and fish), and food is the main source of exposure for the general population. PCBs can be transferred from mother to infant via breast milk. Exposure to these chemicals nearly always occurs as mixtures rather than individual PCB congeners.

Eligible Sample

Study participants aged 3 years and older from NHANES 2001 - 2002 with stored serum available to prepare pooled samples.

Description of Laboratory Methodology

Twenty nine non-dioxin-like polychlorinated biphenyls were measured in serum by gas chromatography/isotope-dilution high-resolution mass spectrometry (GC/ID-HRMS). The analytical method for PCBs is described in Sjodin et al., 2004 and Barr et al., 2003. Reported results met the Division of Laboratory Sciences' quality control and quality assurance performance criteria for accuracy and precision (similar to specifications outlined by Westgard, 1981).

Data Processing and Editing

Specimens were processed, stored, and shipped to DLS, NCEH, CDC (Atlanta, Georgia). The analytical approach used, including data processing is described in detail in Sjodin, et al (2004). Reported results met the Division of Laboratory Sciences' quality control and quality

assurance performance criteria for accuracy and precision (similar to specifications outlined by Westgard, 1981).

Laboratory Quality Assurance 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 [General Documentation on Laboratory Data](#) file for detailed QA/QC protocols. The analytical methods are described in the *Description of the Laboratory Methodology* section.

Analytic Notes

The sampling scheme for NHANES 2001-2002, a complex multistage area probability design, included 11,039 persons. Data were collected through household interviews and through standardized physical examinations conducted in mobile examination centers. On the basis of self-reported data, a composite race/ethnicity variable helped define three major racial/ethnic groups: non-Hispanic blacks, non-Hispanic whites, and Mexican Americans. Informed consent was obtained from all study participants. Serum samples used to prepare pools for analysis were selected from those obtained by venipuncture from 2150 participants, a random one-third subsample of people 12 years of age and older from NHANES 2001-2002 and representative of the U.S. general population for this age range. A total of 1,832 individual serum samples were used to prepare the 54 pooled serum samples analyzed for this subset of NHANES 2001-2002.

After collection of samples, serum specimens were divided into aliquots and were stored cold (2-4°C) or frozen until they were shipped on dry ice to CDC's National Center for Environmental Health (NCEH). Serum samples were stored frozen after receipt at NCEH at -70°C until analyzed. The 2,150 individual serum samples available were categorized in 24 demographic groups (Table 1), each representing a combination of race/ethnicity, gender, and age (12-19 years, 20-39 years, 40-59 years, and 60 years and older). The number of samples available, the number of these samples that were usable, and the number of pools formed in each demographic group are presented in Table 1. On the basis of the number of individual serum samples per demographic group, multiple pools were available for 14 demographic groups, and one pool was available for 10 demographic groups (Table 1). To ensure that no individual sample overly influenced the pooled results, all serum samples included in any one pool (25.5 mL each) were of equal volume (i.e., each individual sample contributed 750 µL). Most pools included 34 individual serum samples that were randomly selected. Only 31 individual serum samples were available, however, for the pool representing non-Hispanic black men 60 years of age or older. In addition, one of the two pools representing Mexican American men between 20 and 39 years of age consisted of only 33 individual specimens.

In addition, residual serum from 3-11 year old NHANES 2001-2002 participants, previously analyzed for cotinine, a marker of environmental tobacco smoke, was used to create pools representing 3-5 year old and 6-11 year old participants. The 1049 individual samples available were categorized in 12 demographic groups, each representing a combination of race/ethnicity, sex, and age (3-5 years and 6-11 years). A total of 937 randomly selected individual samples were used to prepare 24 pools (two per demographic group). The number of samples available, the number of these samples that were usable, and the number of pools formed in each demographic group are presented in Table 1. To ensure that no individual sample overly influenced the pooled results, all samples included in any one pool were of equal volume (i.e., 0.5 mL). Eleven of the individual serum samples from non-Hispanic black females 3-5 years of age contributed <0.5 mL. Each pool included 21 (3-5 year old) or 57 (6-11 year old) individual samples randomly selected (Table 1).

Table 1. Number of individual serum samples available, number of usable samples, and number of pools formed from NHANES 2001–2002 participants per demographic group.

Race/Ethnicity	Gender	Pool Age Group: Minimum - Maximum Age					
		3-5 Years	6-11 Years	12-19 Years	20-39 Years	40-59 Years	>60 Years
		(RIDAGGRP = -1) ¹	(RIDAGGRP = 0)	(RIDAGGRP = 1)	(RIDAGGRP = 2)	(RIDAGGRP = 3)	(RIDAGGRP = 4)
Number of Samples Available / Number of Usable Samples (Number of Pools)							
Non-Hispanic White (RIDRAETN = 1) ¹	Male (RIAGENDR = 1) ¹	58/42 (2)	119/114 (2)	105/102 (3)	112/102 (3)	125/102 (3)	154/136 (4)
	Female (RIAGENDR = 2)	50/42 (2)	115/114 (2)	120/102 (3)	155/136 (4)	120/102 (3)	157/136 (4)
Non-Hispanic Black (RIDRAETN = 2)	Male (RIAGENDR = 1)	49/42 (2)	124/114 (2)	115/102 (3)	54/34 (1)	53/34 (1)	31/31 (1) ²
	Female (RIAGENDR = 2)	42/42 (2)	131/114 (2)	123/102 (3)	63/34 (1)	45/34 (1)	44/34 (1)
Mexican American (RIDRAETN = 3)	Male (RIAGENDR = 1)	51/42 (2)	127/114 (2)	108/102 (3)	67/67 (2) ³	49/34 (1)	36/34 (1)
	Female (RIAGENDR = 2)	55/42 (2)	128/114 (2)	140/136 (4)	84/68 (2)	45/34 (1)	45/34 (1)

¹ Value of this categorical variable in data set² With only 31 usable samples, this pool consisted of 31 samples.³ With only 67 usable samples, one pool consisted of 34 samples and the other consisted of 33 samples.**Guidelines for Working with Pooled-Samples from NHANES 2001-2002**

Because the samples constituting the pools originated from NHANES 2001-2002, which was designed to be representative of the non-institutionalized US population, the pooled results should provide good coverage of the US population. We cannot be assured, however, that estimates based on the pooled samples are unbiased for at least two reasons: 1) the sampling weight information was lost when the samples were pooled because each pool consists of equal volumes of each sample in the pool; and 2) the measured value for a pooled sample (consisting of individual samples that tend to be log-normally distributed) is comparable to an arithmetic average of log-normal results and thus represents a biased estimate of the central tendency (geometric mean or median) of the samples making up the pool. Also, because samples were pooled across the design cells of the original NHANES sampling design, it is not possible to obtain unbiased estimates of standard errors. These bias and standard error issues are being addressed in later NHANES surveys involving pooled samples.

Pooled-Sample weights

The sampling weight information was lost when the samples were pooled because each pool consists of equal volumes of each sample in the pool.

Variance estimation

The sampling scheme for NHANES 2001-2002 is a complex multistage, probability sampling design that selects participants who are representative of the civilian, non-institutionalized U.S. population. Over-sampling of certain population subgroups is done to increase the reliability and precision of health status indicator estimates for those groups. For PCBs, instead of using the full NHANES sample, a random one-third subsample of NHANES participants was used. Curtin et al. (2012) provide documentation of the construction of sampling weights for this one-third subsample. Also, because of the use of stratified multistage selection, incorporation of the sampling design is needed to calculate sampling variances (NCHS, 1994). These variances cannot be calculated for NHANES 2001-2002 pooled sample estimates, however, because samples were pooled across the design cells of the original NHANES 2001-2002 sampling design.

Links to NHANES Data Files

Although this pooled-sample data file cannot be directly linked to other NHANES 2001-2002 data files, it does contain demographic information (RIAGENDR, RIDRAETN, and RIDAGGRP)

for each pooled-sample.

Variables in the data file

Each variable in the data file is given in Table 2 with its definition. The definition used for the numeric constant for categorical variables is given in the column: Definition of Categorical Variables.

The NHANES abbreviation used for each analyte measured with the IUPAC name is given in Table 3. The code "XYZ" in the variable names "ADJUSTED_RESULT_XYZ" and "RESULT_COMMENT_XYZ" as defined in Table 2 corresponds to the Value of the "NHANES code" in Table 3.

Table 2. NHANES Code, Common Abbreviation and IUPAC Name for each analyte reported

Variable	Description	Definition of Categorical Variables
POOLID	Pool identification number	n/a
RIAGENDR	Gender of subjects in pool	1 = Male 2 = Female
RIDRAETN	Race / Ethnicity of subjects in pool	1 = Non-Hispanic White (NHW) 2 = Non-Hispanic Black (NHB) 3 = Mexican American (MA)
RIDAGGRP	Age group of subjects in pool	-1 = 3-5 Year old 0 = 6-11 Year old 1 = 12-19 Year old 2 = 20-39 Year old 3 = 40-59 Year old 4 = >60 Years old
RIANSMP	Number of samples pool	n/a
ADJUSTED_RESULT_XYZ	Reported Concentration (ng/g lipid). "XYZ" in the variable name corresponds to the NHANES abbreviation for each analyte.	n/a
RESULT_COMMENT_XYZ	Code for measured concentration. "XYZ" in the variable name corresponds to the NHANES abbreviation for each analyte	0 = Detectable Result 30 = Non-Reportable Result 37 = Result having a concentration below the limit of detection. The value for the variable "ADJUSTED_RESULT_XYZ" for this analyte corresponds to the limit of detection divided with the square root of 2.

Table 3. NHANES Code, Common Abbreviation and IUPAC Name for each analyte reported

NHANES CODE	Common Abbreviation	IUPAC Name
28	PCB28	2,4,4'-Trichlorobiphenyl
52	PCB52	2,2',5,5'-Tetrachlorobiphenyl
49	PCB49	2,2',4,5'-Tetrachloro biphenyl
44	PCB44	2,2'3,5'-Tetrachloro biphenyl
74	PCB74	2,4,4',5-Tetrachlorobiphenyl
66	PCB66	2,3',4,4'-Tetrachlorobiphenyl
101	PCB101	2,2',4,5,5'-Pentachlorobiphenyl
99	PCB99	2,2',4,4',5-Pentachlorobiphenyl
87	PCB87	2,2',3,4,5'-Pentachlorobiphenyl
110	PCB110	2,3,3',4',6-Pentachlorobiphenyl
151	PCB151	2,2',3,5,5',6-Hexachlorobiphenyl
149	PCB149	2,2',3,4',5',6-Hexachlorobiphenyl
146	PCB146	2,2',3,4',5,5'-Hexachlorobiphenyl
153	PCB153	2,2',4,4',5,5'-Hexachlorobiphenyl
138	PCB138-158	2,2',3,4,4',5' and 2,3,3',4,4',6-Hexachlorobiphenyl
128	PCB128	2,2',3,3',4,4'-Hexachlorobiphenyl
178	PCB178	2,2',3,3',5,5',6-Heptachlorobiphenyl
187	PCB187	2,2',3,4',5,5',6-Heptachlorobiphenyl
183	PCB183	2,2',3,4,4',5',6-Heptachlorobiphenyl
177	PCB177	2,2',3,3',4,5',6'-Heptachlorobiphenyl
172	PCB172	2,2',3,3',4,5,5'-Heptachlorobiphenyl
180	PCB180	2,2',3,4,4',5,5'-Heptachlorobiphenyl
170	PCB170	2,2',3,3',4,4',5-Heptachlorobiphenyl
199	PCB199	2,2',3,3',4,5,5',6-Octachlorobiphenyl
196	PCB196-203	2,2',3,3',4,4',5,6' and 2,2',3,4,4',5,5',6-Octachlorobiphenyl
195	PCB195	2,2',3,3',4,4',5,6-Octachlorobiphenyl
194	PCB194	2,2',3,3',4,4',5,5'-Octachlorobiphenyl
206	PCB206	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl
209	PCB209	2,2',3,3',4,4',5,5',6,6'-Decachloro biphenyl

References

- Barr JB, Maggio VL, Barr DB, Turner WE, Sjodin A, Sandau CD, et al. New high-resolution mass spectrometric approach for the measurement of polychlorinated biphenyls and organochlorine pesticides in human serum. *J Chromatogr B* 2003;794(1):137-48.
- Sjodin A, Jones RS, Lapeza CR, Focant J-F, McGahee EE III, Patterson DG Jr. Semiautomated high-throughput extraction and cleanup method for the measurement of polybrominated diphenyl ethers, polybrominated biphenyls, and polychlorinated biphenyls in human serum. *Anal. Chem.* 2004; 76:1921-7.
- Westgard JO, Barry PL, Hunt MR, Groth T. 1981. A multi-rule Shewhart chart for quality control in clinical chemistry. *Clin Chem* 27: 493-501.

Codebook and Frequencies

POOLID - Pool ID number

Variable Name: POOLID
SAS Label: Pool ID number
English Text: Pool ID number
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
.	Missing	0	0	

RIAGENDR - Gender

Variable Name: RIAGENDR
SAS Label: Gender
English Text: Gender
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Male	38	38	
2	Female	40	78	
.	Missing	0	78	

RIDRAETN - Ethnicity

Variable Name: RIDRAETN

SAS Label: Ethnicity

English Text: Ethnicity

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1	Non-Hispanic White	35	35	
2	Non-Hispanic Black	20	55	
3	Mexican American	23	78	
.	Missing	0	78	

RIDAGGRP - Age Group

Variable Name: RIDAGGRP
SAS Label: Age Group
English Text: Age Group
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0	6 Yrs. to 11 Yrs.	12	12	
1	12 Yrs. to 19 Yrs.	19	31	
2	20 Yrs. to 39 Yrs.	13	44	
3	40 Yrs. to 59Yrs.	10	54	
4	60 Yrs. to 150 Yrs.	12	66	
-1	3 Yrs. to 5 Yrs.	12	78	
.	Missing	0	78	

RIANSMP - Number of samples included in Pool

Variable Name: RIANSMP

SAS Label: Number of samples included in Pool

English Text: Number of samples included in Pool

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
21 to 57	Range of Values	78	78	
.	Missing	0	78	

SS028 - PCB28

Variable Name: SS028

SAS Label: PCB28

English Text: PCB28

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.7 to 6.3	Range of Values	77	77	
.	Missing	1	78	

SS044 - PCB44

Variable Name: SS044**SAS Label:** PCB44**English Text:** PCB44**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.1 to 0.7	Range of Values	77	77	
.	Missing	1	78	

SS049 - PCB49

Variable Name: SS049**SAS Label:** PCB49**English Text:** PCB49**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.2 to 0.5	Range of Values	77	77	
.	Missing	1	78	

SS052 - PCB52

Variable Name: SS052**SAS Label:** PCB52**English Text:** PCB52**Target:** Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.2 to 0.9	Range of Values	77	77	
.	Missing	1	78	

SS066 - PCB66

Variable Name: SS066

SAS Label: PCB66

English Text: PCB66

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.3 to 2.8	Range of Values	78	78	
.	Missing	0	78	

SS074 - PCB74

Variable Name: SS074

SAS Label: PCB74

English Text: PCB74

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1 to 24.7	Range of Values	78	78	
.	Missing	0	78	

SS087 - PCB87

Variable Name: SS087

SAS Label: PCB87

English Text: PCB87

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.3 to 0.9	Range of Values	78	78	
.	Missing	0	78	

SS099 - PCB99

Variable Name: SS099

SAS Label: PCB99

English Text: PCB99

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1 to 16.2	Range of Values	78	78	
.	Missing	0	78	

SS101 - PCB101

Variable Name: SS101

SAS Label: PCB101

English Text: PCB101

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.1 to 1.1	Range of Values	78	78	
.	Missing	0	78	

SS110 - PCB110

Variable Name: SS110

SAS Label: PCB110

English Text: PCB110

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.1 to 0.8	Range of Values	78	78	
.	Missing	0	78	

SS128 - PCB128

Variable Name: SS128

SAS Label: PCB128

English Text: PCB128

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.2 to 0.9	Range of Values	78	78	
.	Missing	0	78	

SS138 - PCB138-158

Variable Name: SS138

SAS Label: PCB138-158

English Text: PCB138-158

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
2.6 to 71.1	Range of Values	78	78	
.	Missing	0	78	

SS146 - PCB146

Variable Name: SS146

SAS Label: PCB146

English Text: PCB146

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.4 to 15.6	Range of Values	78	78	
.	Missing	0	78	

SS149 - PCB149

Variable Name: SS149

SAS Label: PCB149

English Text: PCB149

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.2 to 0.8	Range of Values	78	78	
.	Missing	0	78	

SS151 - PCB151

Variable Name: SS151

SAS Label: PCB151

English Text: PCB151

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.3 to 0.9	Range of Values	78	78	
.	Missing	0	78	

SS153 - PCB153

Variable Name: SS153

SAS Label: PCB153

English Text: PCB153

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
3.3 to 118.6	Range of Values	78	78	
.	Missing	0	78	

SS170 - PCB170

Variable Name: SS170

SAS Label: PCB170

English Text: PCB170

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.9 to 32.1	Range of Values	78	78	
.	Missing	0	78	

SS172 - PCB172

Variable Name: SS172

SAS Label: PCB172

English Text: PCB172

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.4 to 4.8	Range of Values	78	78	
.	Missing	0	78	

SS177 - PCB177

Variable Name: SS177

SAS Label: PCB177

English Text: PCB177

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.3 to 5.6	Range of Values	78	78	
.	Missing	0	78	

SS178 - PCB178

Variable Name: SS178

SAS Label: PCB178

English Text: PCB178

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.4 to 7.5	Range of Values	78	78	
.	Missing	0	78	

SS180 - PCB180

Variable Name: SS180

SAS Label: PCB180

English Text: PCB180

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
1.9 to 100.6	Range of Values	78	78	
.	Missing	0	78	

SS183 - PCB183

Variable Name: SS183

SAS Label: PCB183

English Text: PCB183

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.3 to 9	Range of Values	78	78	
.	Missing	0	78	

SS187 - PCB187

Variable Name: SS187

SAS Label: PCB187

English Text: PCB187

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.5 to 35.4	Range of Values	78	78	
.	Missing	0	78	

SS194 - PCB194

Variable Name: SS194

SAS Label: PCB194

English Text: PCB194

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.4 to 22.7	Range of Values	78	78	
.	Missing	0	78	

SS195 - PCB195

Variable Name: SS195
SAS Label: PCB195
English Text: PCB195
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.3 to 4.1	Range of Values	78	78	
.	Missing	0	78	

SS196 - PCB196-203

Variable Name: SS196
SAS Label: PCB196-203
English Text: PCB196-203
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.4 to 20.1	Range of Values	78	78	
.	Missing	0	78	

SS199 - PCB199

Variable Name: SS199

SAS Label: PCB199

English Text: PCB199

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.4 to 23.7	Range of Values	78	78	
.	Missing	0	78	

SS206 - PCB206

Variable Name: SS206

SAS Label: PCB206

English Text: PCB206

Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.4 to 15.1	Range of Values	78	78	
.	Missing	0	78	

SS209 - PCB209

Variable Name: SS209
SAS Label: PCB209
English Text: PCB209
Target: Both males and females 3 YEARS - 150 YEARS

Code or Value	Value Description	Count	Cumulative	Skip to Item
0.3 to 16.4	Range of Values	78	78	
.	Missing	0	78	

