



Newburgh Area PFAS Biomonitoring Group-Level Results

Introduction

The New York State Department of Health (DOH) PFAS blood testing program for people from the Newburgh area began in November 2016. PFAS stands for perfluoroalkyl and polyfluoroalkyl substances, which are also known as perfluorinated chemicals or PFCs. This information sheet provides group information about the 3,763 people who participated in the Newburgh blood testing program from the beginning through December 2017.

These group results are presented by age and gender to make it possible for individuals to compare their own levels with those of other participants and people living elsewhere who were exposed to PFAS, while keeping individual results confidential. People who did not have a blood test can estimate what their PFAS level might have been by using the information in these tables.

Individual results only provide exposure information and cannot be used to determine whether a person's current illness is due to PFAS or if a future illness is likely to result from PFAS. Future studies of PFAS exposure by scientists, public health experts, and government agencies may provide more definitive information on health effects. Knowledge of an individual's exposure may be helpful in applying this information in the future.

All Newburgh blood testing participants received a lab report from the Wadsworth Center, New York's public health lab, showing their results for six different PFAS (PFOS, PFOA, PFHxS, PFNA, PFHpA, and PFBS). This information sheet provides details about the three chemicals – PFOS, PFOA, and PFHxS – found at higher levels for most participants. Only summary information is provided for PFBS and PFHpA because they were not present in most participants' blood and for PFNA which was found at levels similar to the levels found among residents of the U.S. generally.

As studies have shown, when PFAS are present in drinking water, PFAS levels in blood are expected to be higher than levels in the general U.S. population. Once the exposure to PFAS is prevented, PFAS levels decline in blood by about half over a specific time period (half-life). The exact number of years depends on the type of PFAS. For PFOS, the half-life is four to six years. For PFOA, the half-life is two-four years. For PFHxS, the half-life is eight to nine years.

In Newburgh, the public water system has been drawing from a clean, alternate water source since May 2016. In addition, PFAS are effectively removed from drinking water by granular activated carbon (GAC) filtration systems like the one that has been built for the City of Newburgh. Some people were tested closer to when the water system first switched to an alternate source (blood tests from November 2016-April 2017) and some were tested after they had been connected to the alternate water source for one year or longer (blood tests from May 2017-December 2017). Some of the tables in this information provide PFAS levels for participants according to the time period during which their blood was tested. Generally, people who were tested in the later time period had lower PFAS levels.

List of Data Tables: Tables are used to present eight ways of looking at the data. These are:

- 1: All Participants-** PFOS, PFOA, and PFHxS Levels November 2016 December 2017
- 2: Participants Served by City of Newburgh Water** – PFOS, PFOA, and PFHxS Levels by Gender, Age, and PFOS Levels by Time Period of Blood Tests
- 3: Adults Served by City of Newburgh Water** – PFOS, PFOA, and PFHxS Levels by Number of Years on City of Newburgh Water and Time Period of Blood Tests
- 4: Participants Served by City of Newburgh Water** - Range of PFOS Levels for Adults and Children
- 5: Participants Served by City of Newburgh Water** - Levels of all 6 PFAS tested among Participants and in U.S. Population
- 6: Other Exposed Communities** - PFOS, PFOA and PFHxS levels

The tables show “middle” or 50th percentile PFAS blood level for various groups of participants. The 50th percentile is the middle result among the individual results: half of the people had levels higher and half had levels lower than the 50th percentile. All results are reported in units of micrograms per liter (mcg/L), which equals one part per billion, about one drop of liquid in an Olympic-size swimming pool.

The Data Tables

1: All Participants- PFOS, PFOA, and PFHxS Levels November 2016 - December 2017.

The first table (**Table 1**) provides PFOS, PFOA, and PFHxS levels for all 3,763 participants -- people currently using City of Newburgh water, people using private wells, people who work or attend school in the area, and former residents.

Table 1				
PFOS, PFOA and PFHxS blood test results by drinking water history:				
Participants tested November 2016 through December 2017				
	Number of participants	PFOS (mcg/L)	PFOA (mcg/L)	PFHxS (mcg/L)
		Middle level (50 th percentile)	Middle level (50 th percentile)	Middle level (50 th percentile)
Total	3763	9.9	2.0	5.1
By drinking water history				
Currently on City of Newburgh water	1917	16.3	2.8	10.2
Not currently on City of Newburgh water	1846	6.0	1.6	2.1

For all participants, PFOS levels ranged from non-detectable to greater than 200 micrograms per liter (mcg/L); PFOA levels ranged from non-detectable to greater than 20 mcg/L; and PFHxS levels ranged from non-detectable to greater than 100 mcg/L; Among the 3,763 participants, the 50th percentile PFOS level is 9.9 mcg/L, the 50th percentile PFOA level is 2.0 mcg/L, and the 50th percentile PFHxS level is 5.1 mcg/L. The people served by the City of Newburgh water system had higher levels of PFOS, PFOA and PFHxS than the people who were not served by

City water. Among the 1917 people served by City water at the time of the testing, the 50th percentile PFOS level was 16.3 mcg/L, the 50th percentile PFOA level was 2.8 mcg/L, and 50th percentile PFHxS level was 10.2 mcg/L.

2: Participants Served by City of Newburgh Water – PFOS, PFOA, and PFHxS Levels by Gender and Age

The tables in this section provide information about PFOS, PFOA and PFHxS levels among participants served by the City of Newburgh public water system. The first table (**Table 2a**) shows this information for adults and children. For adults, PFOS, PFOA and PFHxS levels were higher in males than females, and higher in people who are older. This pattern is consistent with PFAS level results in other communities. Once exposure to PFAS stops levels decline in blood naturally.

Table 2a				
PFOS, PFOA and PFHxS blood test results by gender and age group:				
People currently served by City of Newburgh public water,				
Tested November 2016 through December 2017				
	Number of participants	PFOS (mcg/L) Middle level (50 th percentile)	PFOA (mcg/L) Middle level (50 th percentile)	PFHxS (mcg/L) Middle level (50 th percentile)
Adults				
All adults (18 and over)	1569	20.1	3.1	12.7
Adults by gender				
Females	923	18.1	2.9	11.0
Males	646	23.6	3.5	15.4
Adults by gender and age group				
Females 18-39	236	9.0	1.6	5.0
Females 40-59	331	16.7	2.6	9.3
Females 60 and older	356	32.1	4.8	23.7
Males 18-39	156	14.3	2.5	8.9
Males 40-59	246	22.1	3.2	15.0
Males 60 and older	244	34.3	4.5	20.7
Children				
Children (under age 18)	348	8.3	2.0	5.6
Children by gender				
Females	158	8.2	1.8	5.5
Males	190	8.6	2.0	5.7
Children by gender and age group				
Girls younger than 6	34	7.4	2.0	5.2
Girls 6 - 10	42	8.8	2.1	6.0
Girls 11 - 17	82	7.6	1.7	5.2
Boys younger than 6	39	6.2	1.9	4.5
Boys 6 - 10	58	7.8	2.1	5.2
Boys 11 - 17	93	9.2	2.0	6.2

The second table (**Table 2b**) provides PFOS results according to the time period during which participants shown in Table 2a had their blood tested. Comparing the middle levels (50th percentiles) from the earlier time period to the more recent time period shows reduced PFOS levels in almost every gender and age grouping. Evaluations of the two time periods for PFOA and PFHxS show declines over time in most other groups as well (data not shown).

Table 2b				
PFOS blood test results by gender, age group, and time period of test:				
People currently served by City of Newburgh public water,				
Tested November 2016 through December 2017				
	Nov 2016 – April 2017		May 2017 – December 2017	
	Number of participants	PFOS (mcg/L)	Number of participants	PFOS (mcg/L)
		Middle level (50 th percentile)		Middle level (50 th percentile)
Adults				
All adults (18 and over)	831	23.2	738	16.8
Adults by gender				
Females	478	21.2	445	15.1
Males	353	27.5	293	19.2
Adults by gender and age group				
Females 18-39	96	10.8	140	7.8
Females 40-59	159	18.3	172	15.5
Females 60 and older	223	32.3	133	30.9
Males 18-39	76	15.6	80	13.4
Males 40-59	116	25.8	130	18.9
Males 60 and older	161	36.4	83	31.5
Children				
Children (under age 18)	127	8.5	221	7.9
Children by gender				
Females	57	8.7	101	7.5
Males	70	8.3	120	8.6
Children by gender and age group				
Girls younger than 6	11	10.5	23	6.1
Girls 6 - 10	19	8.7	23	8.8
Girls 11 - 17	27	8.5	55	7.3
Boys younger than 6	17	7.0	22	5.3
Boys 6 - 10	23	7.6	35	7.9
Boys 11 - 17	30	9.2	63	9.2

3: Adults Served by City of Newburgh Water – PFOS, PFOA, and PFHxS Levels by Number of Years on City of Newburgh Water

The tables in this section provide information about PFAS levels among participants served by the City of Newburgh public water system according to how long they have been using the public water system. The first table (**Table 3a**) shows this information for adults **by number of years served by the City water supply**. Increasing blood PFOS, PFOA and PFHxS levels for

groups of participants with increasing length of residence suggests exposures to these chemicals from public drinking water may have been occurring for more than 20 years.

Table 3a PFOS, PFOA and PFHxS blood test results for adults by number of years served by City of Newburgh public water: Participants tested November 2016 through December 2017				
	Number of participants	PFOS (mcg/L)	PFOA (mcg/L)	PFHxS (mcg/L)
		Middle level (50 th percentile)	Middle level (50 th percentile)	Middle level (50 th percentile)
Adults (age 18 and over)	1569	20.1	3.1	12.7
Adults by length of residence in City				
less than 10 years	233	12.7	2.5	6.4
10 to 19 years	366	18.0	3.0	10.9
20 or more years	790	25.5	3.6	18.0
Length of residence information missing	180	14.4	2.6	8.0

The second table (**Table 3b**) provides PFOS results according to the time period during which the participants in Table 3a had their blood tested. These results show that the 50th percentile blood PFOS levels decline by approximately 20 to 40 percent from the earlier to the more recent time period for groups of participants with similar lengths of residence in the City. Evaluation of the two time periods and length of residence for PFOA and PFHxS shows middle levels have gone down in all groups for these PFAS as well (data not shown).

Table 3b PFOS blood test results for adults by number of years served by City of Newburgh public water and time period of test: Participants tested November 2016 through December 2017				
	Nov 2016 – April 2017		May 2017 – December 2017	
	Number of participants	PFOS (mcg/L)	Number of participants	PFOS (mcg/L)
		Middle level (50 th percentile)		Middle level (50 th percentile)
Adults (age 18 and over)	831	23.2	738	16.8
Adults by length of residence in City				
less than 10 years	137	14.3	96	11.0
10 to 19 years	198	19.4	168	15.9
20 or more years	412	30.9	378	20.5
Length of residence information missing	84	20.7	96	11.4

4: Participants Served by City of Newburgh Water - Range of PFOS Levels for Adults and Children

Table 4 provides additional information about specific PFOS blood levels among adult and child participants. They show the number of adults and children with PFOS blood levels within specific ranges, for all participants and participants served by the City water supply. This information is provided for PFOS because of the six PFAS measured in blood, levels were highest for PFOS.

Table 4 Number of participants with blood PFOS levels within specific ranges, in micrograms per liter (mcg/L), For people currently served by City of Newburgh public water: Tested from November 2016 through December 2017							
	Up to 5 mcg/L PFOS	Greater than 5 up to 15 mcg/L PFOS	Greater than 15 up to 25 mcg/L PFOS	Greater than 25 up to 50 mcg/L PFOS	Greater than 50 up to 75 mcg/L PFOS	Greater than 75 up to 100 mcg/L PFOS	Greater than 100 mcg/L PFOS
Number of Adults	103	479	364	431	120	53	19
Number of Children	64	248	31	5	0	0	0

5: Participants Served by City of Newburgh Water - Levels of all 6 PFAS tested among Participants and in U.S. population

Table 5 provides summary information for the PFOS, PFOA, PFHxS and three PFAS that were not detected in most participants' blood (PFHpA and PFBS) or were detected at levels similar to levels in the general U.S. population (PFNA). (Table notes are on page 7.)

Table 5 PFAS levels in blood, in micrograms per liter (mcg/L), For people currently served by City of Newburgh public water: Tested from November 2016 through December 2017 with US population levels for comparison						
	City of Newburgh blood testing participants, N=1917		US population in 2013-2014 NHANES participants		US population in 1999-2000 NHANES participants	
	Middle level 50 th percentile	High Level 95 th Percentile	Middle level 50 th percentile	High level 95 th percentile	Middle level 50 th percentile	High level 95 th percentile
PFOS	16.3	67.8	5.20	18.5	30.20	75.70
PFOA	2.8	8.2	2.07	5.57	5.20	11.90
PFHxS	10.2	50.0	1.40	5.60	2.10	8.70
PFNA	0.7	1.9	0.7	2.0	0.6	1.8
PFHpA	Below LOD	Below LOD	Below LOD	Below LOD	**Below LOD	**Below LOD
PFBS	Below LOD	Below LOD	Below LOD	0.2	Below LOD	0.7

Notes for Table 5:

Middle level (50th percentile): Half the people had a result below and half had a result above this level.

High level (95th percentile): 95 out of every 100 people had results below this level.

Below LOD means no level was detected or it was detected at a level so low it could not be quantified.

Source for general U.S. population levels: National Health and Nutrition Examination Survey (NHANES), Fourth National Report on Human Exposure to Environmental Chemicals, U.S. Centers for Disease Control and Prevention (CDC), Updated Tables, January 2017, Volume One. (For PFBS, 1999-2000 data are not available. The data presented are from 2003-2004.)

6: Other Exposed Communities - PFOS, PFOA and PFHxS levels

This last table (**Table 6**) provides information that can be used to compare the PFOS, PFOA and PFHxS levels shown in this information sheet, or individual laboratory results, to levels in other communities that had contamination in their drinking water, people who worked with these chemicals, and the general U.S. population. Comparing PFOS, PFOA and PFHxS levels shows that the middle levels for Newburgh area participants are within the range of levels shown for communities in Alabama and Minnesota where there was contamination of drinking water with these chemicals. General U.S. population levels are included both for 1999-2000 and for 2013-2014 to show how levels have been declining in the general population due to these chemicals being phased out of use beginning in 2000.

- Comparing PFOS, PFOA and PFHxS blood levels for Newburgh participants (**Table 1**) and other populations (**Table 6**) shows that the middle level for PFOS for City of Newburgh participants (16.3 mcg/L) is higher than the middle (5.20 mcg/L) level but lower than the 95th percentile level (18.5 mcg/L) in the general U.S. population for 2013 - 2014. The middle PFOA level for participants currently on Newburgh City water (2.8 mcg/L) is also higher than the middle level (2.07 mcg/L) but lower than the 95th percentile level (5.57 mcg/L) for the general U.S. population in the most recent data, for 2013-2014. The middle PFHxS level for participants currently on Newburgh City water (10.2 mcg/L) is higher than both the middle level (1.4 mcg/L) and the 95th percentile level (5.6 mcg/L) for the general U.S. population in the most recent data, for 2013-2014.
- Comparing PFOS, PFOA and PFHxS blood levels for Newburgh area participants (**Table 1**) to other populations (**Table 6**) shows that participants who did not live in homes served by City of Newburgh water had PFOS, PFOA and PFHxS blood levels very similar to those of the general U.S. population.

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Table 6
PFOS, PFOA and PFHxS levels in blood from other studies: other communities with PFAS in drinking water, people who work with PFAS, and the general U.S. population

OTHER RESULTS FOR COMPARISON	PFOS Results in mcg/L		PFOA Results in mcg/L		PFHxS Results in mcg/L	
Other communities with PFAS in drinking water:	Geometric mean		Geometric mean		Geometric mean	
Morgan-East Lawrence people on private wells, near Decatur, AL 2010	75		29		12	
Morgan-East Lawrence people on public water, near Decatur, AL 2010	40		18		7	
East Metro area people on public water, near Minneapolis, MN 2008	36		15		8	
People who worked with PFAS:	Geometric mean		Geometric mean		Geometric mean	
3M workers, Cottage Grove, MN 2000	1,760		5,200		N.A.	
3M workers, Decatur, AL 2000	910		1,130		180	
General U.S. population:	Middle level (50th percentile)	High level (95th percentile)	Middle level (50th percentile)	High level (95th percentile)	Middle level (50th percentile)	High level (95th percentile)
Age 12 and up: 1999-2000*	30.20	75.70	5.20	11.90	2.10	8.70
Age 12 and up: 2013-2014	5.20	18.5	2.07	5.57	1.40	5.60
Males only	6.40	22.1	2.37	5.67	1.90	6.30
Females only	4.00	15.1	1.67	5.07	1.00	4.90
Young people age 12-19	3.60	9.30	1.67	3.47	1.10	6.30
Children age 6-11	4.02	12.4	1.94	3.84	.850	4.14
Children age 3-5	3.41	8.82	1.80	5.58	.740	1.62
Non-Hispanic blacks	5.30	24.5	1.67	4.60	1.20	5.60
Non-Hispanic whites	5.70	18.0	2.27	5.77	1.50	5.90
Hispanics	3.70	10.8	1.47	3.47	1.10	3.90

mcg/L = micrograms per liter: A microgram per liter equals one part per billion, about one drop of liquid in an Olympic-size swimming pool.

Geometric mean: Geometric means are a way of calculating the middle level. They are used in science to prevent the highest and lowest values from distorting the average when the rest of the data are close together. In most published studies, the geometric mean is used. For blood PFAS data for Newburgh participant groups, the geometric mean and 50th percentile levels are very similar. (Geometric mean values are available upon request.)

Middle level (50th percentile): Half the people had a result below and half had a result above this level.

High level (95th percentile): 95 out of every 100 people had results below this level.

N.A.: Level not available for this group.

* PFAS levels for the general U.S. population for 1999-2000 and the most recently published levels for 2013-2014 are provided. Blood levels of PFOS, PFOA and PFHxS declined over these years because some PFAS began to be phased out of use starting in 2000. The decline for the general U.S. population is particularly strong for PFOS, with blood levels declining from 30.2 to 5.2 micrograms per liter from 1999 to 2014.

Table 6 references:

- 1 General U.S. population: National Health and Nutrition Examination Survey (NHANES), Fourth National Report on Human Exposure to Environmental Chemicals, U.S. Centers for Disease Control and Prevention (CDC), Updated Tables, March 2018, Volume One.
- 2 ATSDR (Agency for Toxic Substances and Disease Registry) (2013) Health Consultation. Exposure Investigation Report. Perfluorochemical Serum Sampling in the vicinity of Decatur, Alabama Morgan, Lawrence, and Limestone Counties. U.S. Department of Health and Human Services. Atlanta GA.
- 3 Minnesota Department of Health (2009) East Metro Perfluorochemical Biomonitoring Pilot Project. July 2009 Technical Report. Minnesota Department of Health. Minneapolis.
- 4 Occupational groups: Olsen GW (2015) "PFAS biomonitoring in higher exposed populations," in DeWitt JC (ed.) Toxicological effects of perfluoroalkyl and polyfluoroalkyl substances. Humana.

Additional information is available on the DOH website, www.health.ny.gov/newburgh. Copies of some materials are available in Spanish and Creole on the DOH website.

The following links provide additional information:

For information about PFAS:

https://www.atsdr.cdc.gov/pfc/docs/pfas_fact_sheet.pdf

The C8 Health Project: Design, Methods, and Participants, December 2009, Frisbee, SJ et al.

www.ncbi.nlm.nih.gov/pubmed/20049206

Frequently Asked Questions: Perfluorochemicals (PFAS) Detected in the Pease Tradesport Water System, February 2016, New Hampshire Department of Health and Human Services.

www.dhhs.nh.gov/dphs/documents/pease-water-faqs.pdf

Blood PFC Testing and Health Information Summary: Morgan, Lawrence and Limestone Counties, Alabama, Agency for Toxic Substances and Disease Registry.

www.atsdr.cdc.gov/HAC/pha/decatour/Blood%20PFC%20Testing%20and%20Health%20Information.pdf

Community exposure to perfluorooctanoate: relationships between serum concentrations and exposure sources, August 2006, Emmet, EA et al. www.ncbi.nlm.nih.gov/pubmed/16902368

TOXFAQs for Perfluoroalkyls. <http://www.atsdr.cdc.gov/toxfaqs/tf.asp?id=1116&tid=237>

Exposure to Environmental Toxins (and breastfeeding).

https://www.cdc.gov/breastfeeding/disease/environmental_toxins.htm

The Surgeon General's Call to Action to Support Breastfeeding

<http://www.surgeongeneral.gov/library/calls/breastfeeding/>

TO CONTACT NYS DOH:

NYS DOH, Center for Environmental Health, Bureau of Environmental and Occupational Epidemiology, Corning Tower, Albany NY 12237; 518-402-7950 or BEOE@health.ny.gov