## **Supplementary Materials**

Exogenous factors associated with legacy PFAS concentrations in the general U.S. population: NHANES 1999-2018

Jordan McAdam<sup>1</sup>, Laura E. Jones<sup>2,3</sup>, Xiaobo Xue Romeiko<sup>1</sup>, Erin M. Bell<sup>1,3</sup>

**Correspondence to:** Dr. Erin M. Bell, Departments of Epidemiology and Biostatistics, School of Public Health, State University of New York, 1 University Place, Rensselaer, NY 12144, USA. E-mail:ebell@albany.edu

<sup>&</sup>lt;sup>1</sup>Department of Environmental Health Sciences, University at Albany, State University of New York, Rensselaer, NY12144, USA.

<sup>&</sup>lt;sup>2</sup>Center for Biostatistics, Bassett Research Institute, Cooperstown, NY 13326, USA.

<sup>&</sup>lt;sup>3</sup>Department of Epidemiology and Biostatistics, School of Public Health, State University of New York, Rensselaer, NY 12144, USA.

## **Supplementary Table 1. Exogenous factors evaluated from NHANES 1999-2018**

Factor	NHANES	NHANES	Categorical/conti	Categories*	
	variable	cycles	nuous		
	name	measured			
Demographics					
Six-month period	RIDEXMON	99-00, 03-04,	Categorical	1= Nov 1 through	
		05-06, 07-08,		Apr 30	
		09-10, 11-12,		2= May 1 through	
		13-14, 15-16,		Oct 31	
		17-18			
NHANES year			Continuous		
Ethnicity†	RIDRETH	99-00, 03-04,	Categorical	1=Mexican-	
		05-06, 07-08,		American	
		09-10, 11-12,		2=Other Hispanic	
		13-14, 15-16,		3=Non-Hispanic	
		17-18		White	
				4=Non-Hispanic	
				Black	
				5=Other race	
				6=Non-Hispanic	
				Asian	
Country of birth	DMDBORN4	99-00, 03-04,	Categorical	1=Born in US or	
		05-06, 07-08,		DC	
		09-10, 11-12,		2=Born Elsewhere	
		13-14, 15-16,			
		17-18			
Sex	RIAGENDR	99-00, 03-04,	Categorical	1=male	
		05-06, 07-08,		2=female	
		09-10, 11-12,			
		13-14, 15-16,			
		17-18			
Age at screening	RIDAGEYR	99-00, 03-04,	Continuous		
		05-06, 07-08,			
		09-10, 11-12,			
		13-14, 15-16,			
		17-18			

Veteran/military status	DMQMILIT	99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Categorical	1=yes 2=no
Citizenship status	DMDCITZN	99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Categorical	1=citizen by birth or naturalization 2=not a citizen of the US
Education level†	DMDEDUC	99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Categorical	1=Less than high school 2=high school diploma 3=more than high school
Marital status	DMDMART L	99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Categorical	1=married 2=widowed 3=divorced 4=separated 5=never married 6=living with partner
Total number of people in household	DMDHHSIZ	99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Continuous	
Annual household income†	INDHHIN2	07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Categorical	1=\$0 - \$4,999 2=\$5,000 - \$9,999 3=\$10,000 - \$14,999 4=\$15,000 - \$19,999 5=\$20,000 - \$24,999

				6=\$25,000 - \$34,999 7=\$35,000 - \$44,999 8=\$45,000 - \$54,999 9=\$55,000 - \$64,999 10=\$65,000 - \$74,999 12=Over \$20,000 13=Under \$20,000 14=\$75,000 - \$99,999 15=≥\$100,000
Annual family income†	INDFMIN2	07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Categorical	1=\$0 - \$4,999 2=\$5,000 - \$9,999 3=\$10,000 - \$14,999 4=\$15,000 - \$19,999 5=\$20,000 - \$24,999 6=\$25,000 - \$34,999 7=\$35,000 - \$44,999 8=\$45,000 - \$54,999 9=\$55,000 - \$64,999 10=\$65,000 - \$74,999 11=Over \$20,000 12=Under \$20,000 13=\$75,000 -

				\$99,999 14=≥\$100,000
Total number of	DMDFMSIZ	09-10, 11-12,	Categorical	1=1
people in family		13-14, 15-16,		2=2
		17-18		3=3
				4=4
				5=5
				6=6
				7=≥7
Family poverty	INDFMPIR	99-00, 03-04,	Continuous	
income ratio		05-06, 07-08,		
		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
		Dietary interv		
		Food consump		
Shellfish	DRD340	99-00, 03-04,	Categorical	1=yes
consumption over		05-06, 07-08,		2=no
the past 30 days		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
Types of shellfish		99-00, 03-04,	Categorical	1=Multiple types
consumed over the		05-06, 07-08,		consumed
past 30 days‡		09-10, 11-12,		2=One type
		13-14, 15-16,		consumed
		17-18		3=None consumed
Fish consumption	DRD360	99-00, 03-04,	Categorical	1=yes
over the past 30		05-06, 07-08,		2=no
days		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
Consumed		99-00, 03-04,	Categorical	1=yes
unknown, other, or		05-06, 07-08,		2=no
breaded fish in the		09-10, 11-12,		
last 30 days§		13-14, 15-16,		
		17-18		

Consumed walleye,		99-00, 03-04,	Categorical	1=yes
trout, pike, perch,		05-06, 07-08,	_	2=no
or bass in the last		09-10, 11-12,		
30 days ∥		13-14, 15-16,		
		17-18		
Consumed		99-00, 03-04,	Categorical	1=yes
swordfish, shark,		05-06, 07-08,		2=no
sea bass, sardines,		09-10, 11-12,		
porgy, pollock,		13-14, 15-16,		
mackerel, haddock,		17-18		
flatfish, cod, or				
tuna in the last 30				
days ¶				
Consumed catfish		99-00, 03-04,	Categorical	1=yes
or salmon in the		05-06, 07-08,		2=no
last 30 days**		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
		Supplement i	ise	
Any dietary	DSD010	99-00, 03-04,	Categorical	1=yes
supplements taken		05-06, 07-08,		2=no
		09-10, 11-12,		
		0, 10, 11 12,		
		13-14, 15-16,		
		13-14, 15-16,	us	
Consumed coffee	PHQ020	13-14, 15-16, 17-18	us Categorical	1=yes
Consumed coffee or tea with cream	PHQ020	13-14, 15-16, 17-18  Fasting state 99-00, 03-04, 05-06, 07-08,		1=yes 2=no
	PHQ020	13-14, 15-16, 17-18  Fasting state 99-00, 03-04,		•
or tea with cream	PHQ020	13-14, 15-16, 17-18  Fasting state 99-00, 03-04, 05-06, 07-08,		•
or tea with cream or sugar since		13-14, 15-16, 17-18  Fasting state 99-00, 03-04, 05-06, 07-08, 09-10, 11-12,		•
or tea with cream or sugar since	PHQ020 PHQ030	13-14, 15-16, 17-18  Fasting state  99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16,		•
or tea with cream or sugar since fasting time		13-14, 15-16, 17-18  Fasting state 99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Categorical	2=no
or tea with cream or sugar since fasting time  Consumed alcohol		13-14, 15-16, 17-18  Fasting state  99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18  99-00, 03-04,	Categorical	2=no 1=yes
or tea with cream or sugar since fasting time  Consumed alcohol such as beer, wine,		13-14, 15-16, 17-18  Fasting state  99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18  99-00, 03-04, 05-06, 07-08,	Categorical	2=no 1=yes
or tea with cream or sugar since fasting time  Consumed alcohol such as beer, wine, or liquor since fasting time	PHQ030	13-14, 15-16, 17-18  Fasting state  99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18  99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Categorical  Categorical	2=no 1=yes
or tea with cream or sugar since fasting time  Consumed alcohol such as beer, wine, or liquor since		13-14, 15-16, 17-18  Fasting state  99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18  99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16,	Categorical	2=no 1=yes

mints, lozenges, or		05-06, 07-08,		2=no
cough drops since		09-10, 11-12,		
fasting time		13-14, 15-16,		
		17-18		
Consumed	PHQ050	99-00, 03-04,	Categorical	1=yes
antacids, laxatives,		05-06, 07-08,		2=no
or anti-diarrheal		09-10, 11-12,		
since fasting time		13-14, 15-16,		
		17-18		
Consumed dietary	PHQ060	99-00, 03-04,	Categorical	1=yes
supplements since		05-06, 07-08,		2=no
fasting time		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
Total length of food	PHAFSTHR	99-00, 03-04,	Continuous	
fast, hours		05-06, 07-08,		
		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
		Questionnaire		
Have you had at	ALQ101	Questionnaire		1=yes
Have you had at least 12 alcoholic	ALQ101	Questionnaire  Alcohol use	е	1=yes 2=no
	ALQ101	Alcohol use 03-04, 05-06,	е	•
least 12 alcoholic	ALQ101	Alcohol use 03-04, 05-06, 07-08, 09-10,	е	•
least 12 alcoholic drinks in the last	ALQ101 ALQ130	Alcohol use 03-04, 05-06, 07-08, 09-10, 11-12, 13-14,	е	•
least 12 alcoholic drinks in the last year?		Alcohol use 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18	e Categorical	•
least 12 alcoholic drinks in the last year? Average number of		Alcohol use 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18 99-00, 03-04,	e Categorical	•
least 12 alcoholic drinks in the last year? Average number of alcoholic drinks per		Alcohol use 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18 99-00, 03-04, 05-06, 07-08,	e Categorical	•
least 12 alcoholic drinks in the last year? Average number of alcoholic drinks per day over past 12		Questionnaire  Alcohol use 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18 99-00, 03-04, 05-06, 07-08, 09-10, 11-12,	e Categorical	•
least 12 alcoholic drinks in the last year? Average number of alcoholic drinks per day over past 12		Questionnaire  Alcohol use 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18 99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16,	e Categorical	•
least 12 alcoholic drinks in the last year? Average number of alcoholic drinks per day over past 12 months	ALQ130	Alcohol use 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18 99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Categorical  Continuous	2=no
least 12 alcoholic drinks in the last year? Average number of alcoholic drinks per day over past 12 months  Ever have 5 or	ALQ130	Questionnaire  Alcohol use  03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18  99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18  99-00, 03-04,	Categorical  Continuous	2=no 1=yes
least 12 alcoholic drinks in the last year? Average number of alcoholic drinks per day over past 12 months  Ever have 5 or more drinks in a	ALQ130	Questionnaire  Alcohol use 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18 99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18 99-00, 03-04, 05-06, 07-08,	Categorical  Continuous  Categorical	2=no 1=yes

supermarket/grocer		13-14, 15-16,		
y store in the last		17-18		
30 days				
Money spent on	CBD090	07-08, 11-12,	Continuous	
nonfood items in		13-14, 15-16,		
the last 30 days		17-18		
Money spent eating	CBD120	07-08, 09-10,	Continuous	
out in the last 30		11-12, 13-14,		
days		15-16, 17-18		
Money spent on	CBD130	07-08, 09-10,	Continuous	
carryout/delivered		11-12, 13-14,		
foods in the last 30		15-16, 17-18		
days				
Eat at restaurants	CBQ550	07-08, 09-10,	Categorical	1=yes
with a waiter in		17-18		2=no
Number of meals	DBD895	07-08, 09-10,	Continuous	
not prepared at		11-12, 13-14,		
home in the last 30		15-16, 17-18		
days				
Number of meals	DBD900	07-08, 09-10,	Continuous	
from fast food or		11-12, 13-14,		
pizza place in the		15-16, 17-18		
last 30 days				
Number of ready-	DBD905	07-08, 09-10,	Continuous	
to-eat foods		11-12, 13-14,		
consumed in the		15-16, 17-18		
last 30 days				
Number of frozen	DBD910	07-08, 09-10,	Continuous	
meals or frozen		11-12, 13-14,		
pizzas consumed in		15-16, 17-18		
the last 30 days				
		Current health	status	
General health	HSD010	05-06, 07-08,	Categorical	1=excellent
status		09-10, 11-12,		2=very good
		13-14, 15-16,		3=good
		17-18		4=fair

				5=poor
Head/chest cold in	HSQ500	99-00, 03-04,	Categorical	1=yes
the last 30 days		05-06, 07-08,		2=no
		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
Stomach or	HSQ510	99-00, 03-04,	Categorical	1=yes
intestinal illness in		05-06, 07-08,		2=no
the last 30 days		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
Flu, pneumonia, or	HSQ520	99-00, 03-04,	Categorical	1=yes
ear infection in the		05-06, 07-08,		2=no
last 30 days		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
Donated blood in	HSQ571	99-00, 03-04,	Categorical	1=yes
last 12 months		05-06, 07-08,		2=no
		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
Blood ever tested	HSQ590	99-00, 03-04,	Categorical	1=yes
for HIV virus?		05-06, 07-08,		2=no
		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
		Diet		
How often do you	DBD100	03-04, 05-06,	Categorical	1=rarely
add salt to your		07-08, 09-10,		2=occasionally
food?		11-12, 13-14,		3=very often
		15-16, 17-18		
What type of salt	DBQ095Z	03-04, 05-06,	Categorical	1=ordinary salt
do you add to your		07-08, 09-10,		2=lite salt
food?		11-12, 13-14,		3=salt substitute
		15-16, 17-18		4=don't use or add
				salt products

				91=other
Are you on a	DRQSDIET	03-04, 05-06,	Categorical	1=yes
special diet?		07-08, 09-10,	-	2=no
_		11-12, 13-14,		
		15-16, 17-18		
How healthy is	DBQ700	05-06, 07-08,	Categorical	1=excellent
your overall diet?		09-10, 11-12,	C	2=very good
·		13-14, 15-16,		3=good
		17-18		4=fair
				5=poor
Past 30 days milk	DBQ197	99-00, 03-04,	Categorical	0=never
consumption		05-06, 07-08,	C	1=rarely—less than
•		09-10, 11-12,		once a week
		13-14, 15-16,		2=sometimes—
		17-18		once a week or
				more, but less than
				once a day
				3=often—once a
				day or more
				4=varied
What kind of milk		99-00, 03-04,	Categorical	1=Whole or regular
do you drink? ††		05-06, 07-08,		2=2%
		09-10, 11-12,		3=1%
		13-14, 15-16,		4=fat free/skim
		17-18		5=soy
				6=other
Regular milk	DBQ229	03-04, 05-06,	Categorical	1=regular milk
consumption (drink		07-08, 09-10,		drinker for most of
milk 5 or more		11-12, 13-14,		life
times per week)		15-16, 17-18		2=never been a
				regular milk
				drinker
				3=milk drinking
				has varied over life
Number of meals	DBD900	07-08, 09-10,	Continuous	
from fast food or		11-12, 13-14,		

pizza place in last 7		15-16, 17-18		
days Number of frozen	DBD910	07-08, 09-10,	Continuous	
meals/pizzas	יולטטט	11-12, 13-14,	Continuous	
consumed in the		15-16, 17-18		
last 30 days		13-10, 17-10		
last 50 days		Drug use		
Ever used	DUQ240	05-06, 07-08,	Categorical	1=yes
cocaine/heroin/met	20(2.0	09-10, 11-12,	e and gerrour	2=no
h		13-14, 15-16,		
		17-18		
Ever used a needle	DUQ370	05-06, 07-08,	Categorical	1=yes
to inject an illegal		09-10, 11-12,	8	2=no
drug		13-14, 15-16,		
		17-18		
		Food securi	tv	
Household worries	FSD032A	03-04, 05-06,	Categorical	1=often true
about running out		07-08, 09-10,	C	2=sometimes true
of food		11-12, 13-14,		3=never true
		15-16, 17-18		
Household food	FSD032B	03-04, 05-06,	Categorical	1=often true
doesn't last		07-08, 09-10,		2=sometimes true
		11-12, 13-14,		3=never true
		15-16, 17-18		
Household cannot	FSD032C	03-04, 05-06,	Categorical	1=often true
afford balanced		07-08, 09-10,		2=sometimes true
meals		11-12, 13-14,		3=never true
		15-16, 17-18		
Household ever	FSD151	03-04, 09-10,	Categorical	1=often true
received emergency		11-12, 13-14,		2=sometimes true
food		15-16, 17-18		3=never true
Household ever	FSQ165	07-08, 09-10,	Categorical	1=often true
received food		11-12, 13-14,		2=sometimes true
stamp benefits		15-16, 17-18		3=never true
		Health insura	псе	

Time without	HIQ210	99-00, 03-04,	Categorical	1=yes
insurance in the last		05-06, 07-08,		2=no
year		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
Does your plan	HIQ270	07-08, 09-10,	Categorical	1=yes
cover		11-12, 13-14,		2=no
prescriptions?		15-16, 17-18		
Are you covered by	HIQ011	99-00, 03-04,	Categorical	1=yes
health insurance?		05-06, 07-08,		2=no
		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
		Hospital us	e	
General health	HUQ010	99-00, 03-04,	Categorical	1=excellent
condition		05-06, 07-08,		2=very good
		09-10, 11-12,		3=good
		13-14, 15-16,		4=fair
		17-18		5=poor
Health now versus	HUQ020	99-00, 03-04,	Categorical	1=better
one year ago		05-06, 07-08,		2=worse
		09-10, 11-12,		3=about the same
		13-14, 15-16,		
		17-18		
Do you have a	HUQ030	99-00, 03-04,	Categorical	1=yes
routine place to go		05-06, 07-08,		2=there is no place
for healthcare?		09-10, 11-12,		3=there is more
		13-14, 15-16,		than one place
		17-18		
What type of place	HUQ040	99-00, 03-04,	Categorical	1=clinic or health
do you go to most		05-06, 07-08,		center
often for		09-10, 11-12		2=doctor's office
healthcare?				or HMO
				3=hospital
				emergency room
				4=hospital

How many times have you received healthcare over the	HUQ050	99-00, 03-04, 05-06, 07-08, 09-10, 11-12	Categorical	outpatient department 5=other place 6=doesn't go to one place most often 0=0 1=1 2=2-3
past year? †				3=4-9 4=10-12 5=>12
Have you been an overnight hospital patient in the last year?	HUQ071	99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Categorical	1=yes 2=no
		Housing characte	eristics	
Number of rooms in home	HOD050	99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Continuous	
How many years have you lived in your home?	HOD060	99-00, 03-04, 05-06, 07-08, 09-10	Categorical	1=<1 year 2=1-2 years 3=3-5 years 4=6-10 years 5=>10 years
Is your home owned, bought, rented, or do you have another arrangement?	HOQ065	99-00, 03-04, 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Categorical	1=owned or being bought 2=rented 3=other arrangement
What is the source of your tap water?	HOQ070	99-00, 03-04, 05-06, 07-08, 09-10	Categorical	1=private/public water company 2=private/public well

				3=something else
Do you have water	HOQ080	99-00, 03-04,	Categorical	1=yes
treatment devices?		05-06, 07-08,		2=no
		09-10		
		Immunization h	istory	
Did you receive the	IMQ011	99-00, 03-04,	Categorical	1=yes, at least 2
hepatitis A		05-06, 07-08,		doses
vaccine?		09-10, 11-12,		2=less than 2 doses
		13-14, 15-16,		3=no doses
		17-18		
Did you receive the	IMQ020	99-00, 03-04,	Categorical	1=yes, at least 3
hepatitis B 3-dose		05-06, 07-08,		doses
series?		09-10, 11-12,		2=less than 3 doses
		13-14, 15-16,		3=no doses
		17-18		
		Income		
Do you receive	INQ020	07-08, 09-10,	Categorical	1=yes
income from		11-12, 13-14,		2=no
wages/salaries?		15-16, 17-18		
Do you receive	INQ012	07-08, 09-10,	Categorical	1=yes
income from self-		11-12, 13-14,		2=no
employment?		15-16, 17-18		
Do you receive	INQ030	07-08, 09-10,	Categorical	1=yes
income from social		11-12, 13-14,		2=no
security or railroad		15-16, 17-18		
retirement?				
Do you receive	INQ060	07-08, 09-10,	Categorical	1=yes
income from		11-12, 13-14,		2=no
another disability		15-16, 17-18		
pension?				
Do you receive	INQ080	07-08, 09-10,	Categorical	1=yes
income from		11-12, 13-14,		2=no
retirement or		15-16, 17-18		
survivor pension?				
Do you receive	INQ090	07-08, 09-10,	Categorical	1=yes
income from		11-12, 13-14,		2=no

supplemental		15-16, 17-18		
security income?				
Do you receive	INQ132	07-08, 09-10,	Categorical	1=yes
income from state		11-12, 13-14,		2=no
or county cash		15-16, 17-18		
assistance?				
Do you receive	INQ140	07-08, 09-10,	Categorical	1=yes
income from		11-12, 13-14,		2=no
interest/dividends		15-16, 17-18		
or rentals?				
Do you receive	INQ150	07-08, 09-10,	Categorical	1=yes
income from other		11-12, 13-14,		2=no
sources?		15-16, 17-18		
Monthly family	IND235	07-08, 09-10,	Categorical	1=\$0-\$399
income		11-12, 13-14,		2=\$400 - \$799
		15-16, 17-18		3=\$800 - \$1249
				4=\$1250 - \$1649
				5=\$1650 - \$2099
				6=\$2100 - \$2899
				7=\$2900 - \$3749
				8=\$3750 - \$4599
				9=\$4600 - \$5399
				10=\$5400 - \$6249
				11=\$6250 - \$8399
				12=\$8400 and over
Family monthly	INDFMMPC	07-08, 09-10,	Categorical	1=Monthly poverty
poverty level		11-12, 13-14,		level index <= 1.30
category		15-16, 17-18		2=1.30 < Monthly
				poverty level index
				<= 1.85
				3= Monthly
				poverty level
				index > 1.85
		Depression scre	ening	
Depression		05-06, 07-08,	Categorical	1=no depression
screening results‡‡		09-10, 11-12,		2=mild depression

		13-14, 15-16,		3=moderate or
		17-18		severe depression
		Occupation	n	
Type of work done	OCD150	99-00, 03-04,	Categorical	1=working at a job
in the last week		05-06, 07-08,		or business
		09-10, 11-12,		2=with a job or
		13-14, 15-16,		business but not at
		17-18		work
				3=looking for work
				4=not working at a
				job or business
Hours worked last	OCQ180	99-00, 03-04,	Continuous	
week among all		05-06, 07-08,		
jobs		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
Description of	OCQ260	99-00, 03-04,	Categorical	1=An employee of
job/work situation		05-06, 07-08,		a private company,
		09-10, 11-12,		business, or
		13-14, 15-16,		individual for
		17-18		wages, salary, or
				commission
				2=a federal
				government
				employee
				3=a state
				government
				employee
				4=a local
				government
				employee
				5=self-employed in
				own business,
				professional
				practice, or farm
				6=working without
				2

				pay in family business or farm
Kind of work you	OCD390G	09-10, 11-12,	Categorical	1=enter occupation
have done the		13-14, 15-16,	C	2=same as current
longest		17-18		occupation
S				3=armed forces
				4=never worked
		Oral health	'n	
How often in the	OHQ620	05-06, 07-08,	Categorical	1=very often
last year have you		09-10, 11-12,		2=fairly often
had aching in your		13-14, 15-16,		3=occasionally
mouth		17-18		4=hardly ever
				5=never
In the last year,	OHQ640	05-06, 07-08,	Categorical	1=very often
have you had		09-10, 11-12,		2=fairly often
difficulty with your		13-14, 15-16,		3=occasionally
job because of your		17-18		4=hardly ever
mouth				5=never
In the last year,	OHQ680	05-06, 07-08,	Categorical	1=very often
have you been		09-10, 11-12,		2=fairly often
embarrassed		13-14, 15-16,		3=occasionally
because of your		17-18		4=hardly ever
mouth				5=never
When did you last	OHQ030	99-00, 03-04,	Categorical	1=6 months or less
visit the dentist?		11-12, 13-14,		2=More than 6
		15-16, 17-18		months, but not
				more than 1 year
				ago
				3=More than 1
				year, but not more
				than 2 years ago
				4=More than 2
				years, but not more
				than 3 years ago
				5=More than 3
				years, but not more

Rate the health of your teeth and gums	OHQ845	09-10, 11-12, 13-14, 15-16, 17-18	Categorical	than 5 years ago 6=More than 5 years ago 1=excellent 2=very good 3=good 4=fair 5=poor
		Pesticide us		
Products used in	PUQ100	05-06, 07-08,	Categorical	1=yes
the home to control		09-10, 11-12,		2=no
insects		13-14, 15-16,		
		17-18		
Products used at	PUQ110	05-06, 07-08,	Categorical	1=yes
home to kill weeds		09-10, 11-12,		2=no
		13-14, 15-16,		
		17-18		
		Physical activ	vity	
Does your work	PAQ605	07-08, 09-10,	Categorical	1=yes
involve vigorous		11-12, 13-14,		2=no
activity?		15-16, 17-18		
Does your work	PAQ620	07-08, 09-10,	Categorical	1=yes
involve moderate		11-12, 13-14,		2=no
activity?		15-16, 17-18		
Do you walk or use	PAQ635	07-08, 09-10,	Categorical	1=yes
a bicycle for at		11-12, 13-14,		2=no
least 10 minutes		15-16, 17-18		
continuously to get				
to and from places?				
Do you do any	PAQ650	07-08, 09-10,	Categorical	1=yes
vigorous-intensity		11-12, 13-14,		2=no
sports, fitness, or		15-16, 17-18		
recreational				
activities that cause				
large increases in				
breathing or heart				

rate, such as running or basketball for at least 10 minutes continuously?				
Do you do any	PAQ665	07-08, 09-10,	Categorical	1=yes
moderate-intensity		11-12, 13-14,	8	2=no
sports, fitness, or		15-16, 17-18		
recreational		•		
activities that cause				
a small increase in				
breathing or heart				
rate, such as brisk				
walking, bicycling,				
swimming, or golf				
for at least 10				
minutes				
continuously?				
		Sexual behav	ior	
How old were you	SXD031	99-00, 03-04,	Continuous	
		05-06, 07-08,		
when you first had				
when you first had sex?		09-10, 11-12,		
•				
•		09-10, 11-12, 13-14, 15-16 Sleep		
•	SLD010H	09-10, 11-12, 13-14, 15-16 Sleep 05-06, 07-08,	Continuous	
sex?	SLD010H	09-10, 11-12, 13-14, 15-16 Sleep	Continuous	
How much sleep do		09-10, 11-12, 13-14, 15-16 Sleep 05-06, 07-08, 09-10, 11-12, 13-14	Continuous	
How much sleep do you get regularly?  Have you ever told	SLD010H SLQ050	09-10, 11-12, 13-14, 15-16 Sleep 05-06, 07-08, 09-10, 11-12, 13-14 05-06, 07-08,	Continuous	 1=yes
How much sleep do you get regularly?  Have you ever told a doctor you had		09-10, 11-12, 13-14, 15-16 Sleep 05-06, 07-08, 09-10, 11-12, 13-14 05-06, 07-08, 09-10, 11-12,		
How much sleep do you get regularly?  Have you ever told		09-10, 11-12, 13-14, 15-16 Sleep 05-06, 07-08, 09-10, 11-12, 13-14 05-06, 07-08,		1=yes
How much sleep do you get regularly?  Have you ever told a doctor you had		09-10, 11-12, 13-14, 15-16 Sleep 05-06, 07-08, 09-10, 11-12, 13-14 05-06, 07-08, 09-10, 11-12,		1=yes
How much sleep do you get regularly?  Have you ever told a doctor you had trouble sleeping?  Have you ever been		09-10, 11-12, 13-14, 15-16  Sleep 05-06, 07-08, 09-10, 11-12, 13-14 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18 05-06, 07-08,		1=yes 2=no 1=yes
How much sleep do you get regularly?  Have you ever told a doctor you had trouble sleeping?  Have you ever been told by a doctor	SLQ050	09-10, 11-12, 13-14, 15-16  Sleep 05-06, 07-08, 09-10, 11-12, 13-14 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18	Categorical	1=yes 2=no
How much sleep do you get regularly?  Have you ever told a doctor you had trouble sleeping?  Have you ever been	SLQ050	09-10, 11-12, 13-14, 15-16  Sleep 05-06, 07-08, 09-10, 11-12, 13-14 05-06, 07-08, 09-10, 11-12, 13-14, 15-16, 17-18 05-06, 07-08,	Categorical	1=yes 2=no 1=yes

		Smoking		
Have you smoked	SMQ020	99-00, 03-04,	Categorical	1=yes
at least 100		05-06, 07-08,		2=no
cigarettes in your		09-10, 11-12,		
lifetime?		13-14, 15-16,		
		17-18		
Does anyone in	SMD410	99-00, 03-04,	Categorical	1=yes
your home smoke?		05-06, 07-08,		2=no
		09-10, 11-12		
Have you used	SMQ680	99-00, 03-04,	Categorical	1=yes
tobacco/nicotine in		05-06, 07-08,		2=no
the last 5 days?		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
		Weight		
How do you	WHQ030	99-00, 03-04,	Categorical	1=overweight
consider your		05-06, 07-08,		2=underweight
weight?		09-10, 11-12,		3=about the right
		13-14, 15-16,		weight
		17-18		
Have you tried to	WHQ070	99-00, 03-04,	Categorical	1=yes
lose weight in the		05-06, 07-08,		2=no
last year?		09-10, 11-12,		
		13-14, 15-16,		
		17-18		
At what age were	WHQ150	07-08, 09-10,	Continuous	
you at your		11-12, 13-14,		
heaviest weight?		15-16, 17-18		

<sup>\*</sup>Each categorical variable also included option 7=refused or 9=don't know

§Due to small numbers of respondents and many categories of fish, we created this variable with NHANES variables DRD370 A, T, and U based on the type of fish and fish habitat.

<sup>†</sup>Indicates variable changed over time during NHANES cycles and we recoded to indicated categories.

<sup>‡</sup>Due to small numbers of respondents and many categories of shellfish, we created this variable with NHANES variables DRD350A-J.

- I Due to small numbers of respondents and many categories of fish, we created this variable with NHANES variables DRD370 C, I, J, and S based on the type of fish and fish habitat.
- ¶ Due to small numbers of respondents and many categories of fish, we created this variable with NHANES variables DRD370 B, E, F, G, H, K, L, N, O, and Q based on the type of fish and fish habitat.
- \*\* Due to small numbers of respondents and many categories of fish, we created this variable with NHANES variables DRD370 D and M based on the type of fish and fish habitat.
- ††Due to small numbers of respondents and many categories of milk, we created this variable with NHANES variables DBQ 223A-E and DBQ223U.
- ‡‡Categorized depression status based on NHANES variables DBQ010-100 based on the PHQ-9 referenced by NHANES (Kroenke, Spitzer, & Williams, 2001).

**Supplementary Table 2. Covariate descriptions and levels shown in Figures 1-5** 

Tr	J	D c	
Covariate name (in Figure)	NHANES variable name	Reference group (categorical variables only)	Description
Year	*	-	NHANES cycle (e.g., 2003- 2004)
Sex (Male)	RIAGENDR	Female sex	Sex (male vs female)
Age	RIDAGEYR	-	Age (in years) at screening
Poverty Index	INDFMPIR	Family poverty income ratio	Poverty and income measure
Native-born	DMDBORN4	Born outside of US	Born in US versus born outside of US
Household size	DMDHHSIZ	-	Total number of people in household
Health Access: Clinic Health Access: Office Health Access: ER Health Access: COutpatient	HUQ040	Receive healthcare at some other place (i.e., not a clinic, doctor's office, ER, or outpatient center)	Type of place participant most often goes to for healthcare
Emergency Food Sometimes	FSD151	Emergency food received often	Statement with three levels of responses (often true, sometimes true, never true): Household ever received emergency food
Food Insecurity Sometimes Food Insecurity Never	FSD032A	Food insecurity experienced often	Statement with three levels of responses (often true, sometimes true, never true): Household worries about running out of food
Health Visits	HUQ050	Health care visits: Zero in	Number of times participants

Once Health Visits 2-3 times Health Visits 4-9 times Health Visits 10-12 times Health Visits > 12 times		the last year	received healthcare over the past year
Eats Fish	*	Has not consumed freshwater fish over last 30 days	Ever vs never has the participants consumed freshwater fish over last 30 days
Eats Shellfish	DRD340	Has not consumed shellfish over last 30 days	Ever vs never has the participants consumed shellfish over last 30 days
Food Insecurity Sometimes Food Insecurity Never	FSD032B	Food insecurity experienced often	Statement with three levels of responses (often true, sometimes true, never true): Household food doesn't last
Race: Mexican Race: Other Hispanic Race: NH Black Race: NH Asian Race: Other	RIDRETH	Non-Hispanic White	Participant's race or ethnicity identification
Home Renter Home Owner	HOQ065	Other arrangement	Response to: "Is your home owned, bought, rented, or do you have another arrangement?"
Has Sleep Issues	SLQ050	Does not have sleep issues	Yes/no response to: "Have you ever told a doctor you had

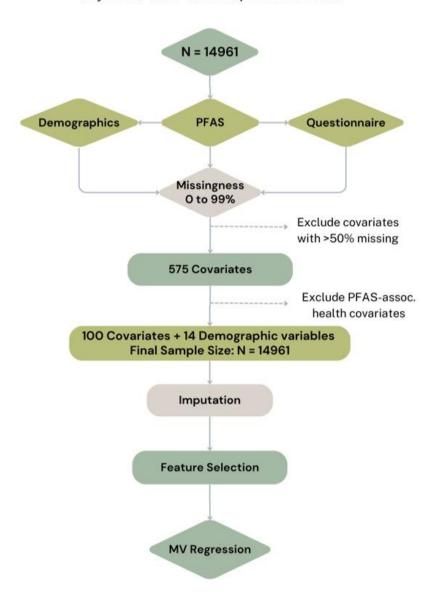
trouble sleeping?"

Married			
Widowed			
Divorced	DMDMARTL	Living with norther	Marital status
Separated	DMDMARIL	Living with partner	Maritai status
Never			
Married			
Income Level			
75K-99K	INDHHIN2	\$0-\$4,999	Annual household income
Income Level	INDITIIN2	φ <b>υ-</b> φ <del>4</del> ,999	Amidai nousenoid income
<2K			
Has		Does not receive	Yes/no response to: "Do you
Retirement	INQ030	retirement income	receive income from social
Income		retirement meome	security or railroad retirement?"
Is Smoker	SMD410	No smoking	Yes/no response to: "Does
10 211101101	21.12 110	1.00 511101111112	anyone in your home smoke?"
Eats		Has not eaten fish in the	Ever vs never has the participant
Freshwater	DRD360	last 30 days	consumed fish over last 30 days
Fish		iust 50 days	consumed his over last 50 days
Fast Duration	PHAFSTHR	-	Total length of food fast, hours
US Citizen	DMDCITZN	Not a US citizen	US citizenship status

<sup>\*</sup>Variable created for this study using information from NHANES.

## **Process Flow**

1999-2018 (2001-2 omitted)
18 years or older with complete PFAS data



**Supplementary Figure 1.** Workflow pipeline including sample selection from NHANES cycles 1999-2018 (2001-2 omitted), imputation, feature selection and regression.