Supplementary Table S1. Abbreviations for legacy PFASs and alternatives examined in the present study

Abbreviation	Full name
HFPO-DA	hexafluoropropylene oxide-dimer acid
PFDA	Perfluoro-n-decanoic acid
PFDoA	Perfluoro-n-dodecanoic acid
n-PFHxS	Potassium perfluorohexanesulfonate
br-PFHxS	Sum of all branched isomers PFHxS
PFNA	Perfluoro-n-nonanoic acid
PFOA	perfluorooctanoic acid

Supplementary Table S2. Precursor and product ions for compounds analyzed in negative ionization mode

Compound	Precursor ion (m/z)	Product ions (m/z)	Collision energy (eV)	Retention time (min)
HFPO-DA	284.9	185.0	1	4.72
PFDA	512.96	468.9*	9	10.06
PFDoA	612.95	569.0*	9	11.35
n-PFHxS	398.93	98.9	41	5.68
br-PFHxS	398.93	98.9	41	5.46
PFNA	462.96	418.9*	9	8.31
PFOA	413.06	369.1*	8	6.75

Note. *Quantitative transition.

Supplementary Table S3. Limit of detection (LOD), limit of quantification (LOQ), percentage recovery and precision for the target PFAS compounds analyzed

Compound	LOD	LOQ	Recovery (%)			Intra-day precision (%)			Inter-day precision (%)		
	(ng/mL)	(ng/mL)	Low	Medium	High	Low	Medium	High	Low	Medium	High
HFPO-DA	0.009	0.029	91.9	97.4	98.1	4.3	5.8	4.5	6.4	7.6	8.4
PFDA	0.007	0.025	104	92.2	103	3.4	4.7	3.3	3.0	0.4	8.3
PFDoA	0.008	0.026	113	84.1	93.3	7.1	6.2	3.5	10.3	2.5	6.8
n-PFHxS	0.007	0.022	90.5	94.5	100	2.3	4.7	2.2	10.3	4.4	8.5
br-PFHxS	0.010	0.032	106	95.2	111	9.7	4.8	1.9	9.7	12.1	6.0
PFNA	0.006	0.021	96.4	91.8	104	3.3	4.5	1.3	10.3	1.9	9.9
PFOA	0.010	0.033	92.2	94.0	102	3.4	4.9	1.1	3.8	5.5	7.4

Note. LOD, limit of detection; LOQ, limit of quantification.

Supplementary Table S4. Distribution of variables before and after interpolation

Variable	Missing rate	Pre-interpretation	Post-interpretation
		Mean ± SD/Median (Q1, Q3)/Percentage	Mean ± SD/Median (Q1, Q3)/Percentage
BMI	2 (0.006)	23.50±3.655	23.50±3.655
PG Ⅰ	17 (0.05)	60.3 (50.0, 76.2)	61.10 (51.50, 78.40)
PG Ⅱ	17 (0.05)	7.44 (5.94, 9.64)	7.53 (6.03, 10.03)
PG Ⅰ / Ⅱ	17 (0.05)	8.13 (6.73, 9.76)	8.14 (6.72, 9.84)
Smoking	1 (0.003)		
Non-smoking		283 (84.7)	283 (84.5)
Former-smoking		9 (2.7)	10 (3.0)
Current-smoking		42 (12.6)	42 (12.5)
Drinking	1 (0.003)		
Non-drinking		292 (87.4)	293 (87.5)
Former-drinking		3 (0.9)	3 (0.9)
Current-drinking		39 (11.7)	39 (11.6)

Supplementary Table S5. Characteristics of the research object (*N* = 335)

variables	Total (*n* = 335)
Age, years	37.52±4.17
BMI, kg/m^2	23.50±3.66
Waist, cm	79.56±11.03
Gender	
Female	206(61.5)
Male	129(38.5)
Education	
Below bachelor's degree	55(16.4)
Bachelor's degree and above	278(83.6)
Occupation	
Administrator	145(43.3)
Others	190(56.7)
Smoking	
Non-smoking	283(84.5)
Former-smoking	10(3.0)
Current-smoking	42(12.5)
Drinking	
Non-drinking	293(87.5)
Former-drinking	3(0.9)
Current-drinking	39(11.6)
Physical activity	
Meditation	59(17.6)
Mild activity	217(64.8)

Moderate activity	56(16.7)
Heavy activity	3(0.9)
SBP, mmHg	115.72±14.50
DBP, mmHg	72.96±9.98
Glucose, mmol/L	5.47±1.19
TC, mmol/L	5.00(4.60, 5.50)
TG, mmol/L	1.11(0.78, 1.77)
PGI, ng/mL	61.10(51.50, 78.40)
PGII, ng/mL	7.53(6.03, 10.03)
PG I/II, ng/mL	8.14 (6.72, 9.84)

Note. Data are mean ± SD or percentage or median (Q1, Q3). Abbreviations: BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; TC, total cholesterol; TG, triglyceride; PGI, pepsinogen I; PGII, pepsinogen II; PG I/II, pepsinogen I/II

Supplementary Table S6. Concentrations of serum PFAS among young and middle-aged adults (N = 335)

PFAS (ng/mL)	**Quantifiable percent (%)**	**Median (interquartile range)**	**Geometric mean (95% *CI*)**
HFPO-DA	96%	0.0107 (0.0107, 0.0178)	0.0117 (0.0115, 0.0120)
PFDA	100%	1.532 (0.917, 2.682)	1.597(1.461, 1.746)
PFDoA	89%	0.011 (0.010, 0.018)	0.013(0.012, 0.014)
n-PFHxS	100%	2.283 (1.566, 3.107)	2.172(2.033, 2.321)
br-PFHxS	100%	0.039 (0.007, 0.075)	0.027(0.024, 0.031)
PFNA	100%	13.061 (2.185, 75.692)	13.370(10.859, 16.461)
PFOA	100%	11.770 (8.578, 16.302)	11.728(11.143, 12.345)

Note. Abbreviations: PFAS, per- and polyfluoroalkyl substances; HFPO-DA, hexafluoropropylene oxide-dimer acid; PFDA, Perfluoro-n-decanoic acid; PFDoA, Perfluoro-n-dodecanoic acid; n-PFHxS, Potassium perfluorohexanesulfonate; br-PFHxS, Sum of all branched isomers PFHxS; PFNA, Perfluoro-n-nonanoic acid; PFOA, perfluorooctanoic acid.

Supplementary Table S7. Spearman correlations between concentrations of plasma PFAS and serum PG among young and middle-aged adults

PFASs(ng/mL)	**PGI**		**PGII**		**PG I/II**	
	r	*p*	r	*p*	r	*p*
HFPO-DA	0.019	0.074	-0.248	0.000	0.330	0.000
PFDA	0.057	0.308	0.173	0.011	-0.108	0.067
PFDoA	0.137	0.034	-0.132	0.019	0.205	0.000
n-PFHxS	0.081	0.264	0.231	0.001	-0.237	0.000
br-PFHxS	-0.062	0.188	0.309	0.000	-0.360	0.000
PFNA	0.033	0.677	0.292	0.000	-0.334	0.000
PFOA	0.042	0.457	0.151	0.022	-0.193	0.000

Note. Abbreviations: PFAS, per- and polyfluoroalkyl substances; HFPO-DA, hexafluoropropylene oxide-dimer acid; PFDA, Perfluoro-n-decanoic acid; PFDoA,

Perfluoro-n-dodecanoic acid; n-PFHxS, Potassium perfluorohexanesulfonate; br-PFHxS, Sum of all branched isomers PFHxS; PFNA, Perfluoro-n-nonanoic acid; PFOA, perfluorooctanoic acid; PGI, pepsinogen I; PGII, pepsinogen II; PG I/II, pepsinogen I/II.

Supplementary Table S8. Dose-response relationship between PFAS and pepsinogen

PFASs(ng/mL)	**PGI**	**PGII**	**PG I/II**
	Nonlinear P- value	Nonlinear P- value	Nonlinear P- value
HFPO-DA	0.779	0.228	0.293
PFDA	0.035	0.040	0.258
PFDoA	0.004	0.013	0.574
n-PFHxS	0.041	0.370	0.944
br-PFHxS	0.058	0.425	0.397
PFNA	0.016	<0.001	0.039
PFOA	0.013	0.492	0.699

Note. [a]Adjusted for sex, age, BMI, smoking, alcohol status. Abbreviations: PFAS, per- and polyfluoroalkyl substances; HFPO-DA, hexafluoropropylene oxide-dimer acid; PFDA, Perfluoro-n-decanoic acid; PFDoA, Perfluoro-n-dodecanoic acid; n-PFHxS, Potassium perfluorohexanesulfonate; br-PFHxS, Sum of all branched isomers PFHxS; PFNA, Perfluoro-n-nonanoic acid; PFOA, perfluorooctanoic acid; PGI, pepsinogen I; PGII, pepsinogen II; PG I/II, pepsinogen I/II.

Supplementary Table S9. Multiple linear regression of individual PFAS with pepsinogen, with subgroup analyses by gender

Ln-PFASs(ng/mL)	**PGI**		**PGII**		**PG I/II**	
	Adjusted β(95% *CI*)	*P*	Adjusted β(95% *CI*)	*P*	Adjusted β(95% *CI*)	*P*
Male						
HFPO-DA	0.008(-0.042, 0.059)	0.742	-0.059(-0.121, 0.002)	0.060	0.066(0.013, 0.118)	0.015
PFDA	0.008(-0.071, 0.088)	0.833	0.040(-0.059, 0.138)	0.426	-0.030(-0.115, 0.055)	0.493
PFDoA	-0.024(-0.240, 0.192)	0.825	-0.139(-0.406, 0.128)	0.304	0.109(-0.123, 0.340)	0.354
n-PFHxS	-0.108(-0.229, 0.012)	0.078	-0.125(-0.275, 0.025)	0.101	0.002(-0.129, 0.133)	0.975
br-PFHxS	-0.014(-0.065, 0.038)	0.603	0.071(0.008, 0.134)	0.028	-0.085(-0.139, -0.032)	0.002
PFNA	0.006(-0.029, 0.041)	0.733	0.056(0.014, 0.099)	0.010	-0.049(-0.086, -0.012)	0.010
PFOA	-0.066(-0.212, 0.080)	0.373	-0.060(-0.242, 0.122)	0.514	-0.031(-0.188, 0.127)	0.701
Female						
HFPO-DA	0.014(-0.020, 0.048)	0.404	-0.041(-0.080, -0.001)	0.044	0.054(0.023, 0.085)	< 0.001
PFDA	0.074(0.017, 0.132)	0.012	0.060(-0.009, 0.128)	0.088	-0.003(-0.057, 0.052)	0.920
PFDoA	0.056(-0.005, 0.117)	0.070	-0.015(-0.087, 0.057)	0.682	0.071(0.015, 0.127)	0.014
n-PFHxS	-0.001(-0.078,	0.972	0.107(0.018, 0.197)	0.019	-0.111(-0.181, -0.041)	0.002

	0.076)					
br-PFHxS	0.006(-0.035, 0.047)	0.774	0.083(0.036, 0.130)	<0.001	-0.080(-0.117, -0.044)	<0.001
PFNA	0.001(-0.025, 0.025)	0.999	0.045(0.016, 0.074)	0.002	-0.051(-0.074, -0.029)	<0.001
PFOA	0.012(-0.094, 0.118)	0.818	0.132(0.008, 0.255)	0.037	-0.132(-0.229, -0.035)	0.008

Note. [a]Adjusted for age, BMI, smoking, alcohol status. Abbreviations: PFAS, per- and polyfluoroalkyl substances; HFPO-DA, hexafluoropropylene oxide-dimer acid; PFDA, Perfluoro-n-decanoic acid; PFDoA, Perfluoro-n-dodecanoic acid; n-PFHxS, Potassium perfluorohexanesulfonate; br-PFHxS, Sum of all branched isomers PFHxS; PFNA, Perfluoro-n-nonanoic acid; PFOA, perfluorooctanoic acid; PGI, pepsinogen I; PGII, pepsinogen II; PG I/II, pepsinogen I/II.

Supplementary Table S10. Multiple linear regression of individual PFAS with pepsinogen, with subgroup analyses by age

Ln-PFASs(ng/mL)	**PGI**		**PGII**		**PG I/II**	
	Adjusted β (95% *CI*)	*P*	Adjusted β (95% *CI*)	*P*	Adjusted β (95% *CI*)	*P*
Age<=35year						
HFPO-DA	0.028(-0.017, 0.072)	0.217	-0.049(-0.098, 0.001)	0.054	0.091(0.052, 0.129)	<0.001
PFDA	0.027(-0.049, 0.104)	0.480	-0.008(-0.095, 0.079)	0.084	0.033(-0.041, 0.106)	0.380
PFDoA	0.076(0.004, 0.149)	0.039	0.023(-0.060, 0.106)	0.581	0.073(0.004, 0.142)	0.039
n-PFHxS	0.013(-0.106, 0.132)	0.828	-0.004(-0.138, 0.129)	0.947	-0.007(-0.121, 0.107)	0.903
br-PFHxS	0.007(-0.049, 0.062)	0.807	0.082(0.021, 0.142)	0.009	-0.075(-0.125, -0.024)	0.005
PFNA	-0.002(-0.034, 0.030)	0.893	0.049(0.014, 0.084)	0.006	-0.052(-0.081, -0.023)	<0.001
PFOA	0.027(-0.118, 0.171)	0.716	-0.010(-0.173, 0.152)	0.900	0.003(-0.135, 0.141)	0.965
Age>35year						
HFPO-DA	0.004(-0.031, 0.040)	0.809	-0.044(-0.088, 0.000)	0.050	0.041(0.005, 0.077)	0.026
PFDA	0.069(0.010, 0.128)	0.022	0.080(0.007, 0.153)	0.033	-0.026(-0.087, 0.034)	0.389
PFDoA	0.011(-0.078, 0.100)	0.801	-0.094(-0.204, 0.015)	0.091	0.086(-0.004, 0.175)	0.060
n-PFHxS	-0.041(-0.118, 0.037)	0.302	0.063(-0.033, 0.159)	0.195	-0.092(-0.169, -0.014)	0.021
br-PFHxS	-0.003(-0.043, 0.036)	0.862	0.077(0.029, 0.125)	0.002	-0.082(-0.121, -0.044)	<0.001
PFNA	0.006(-0.020, 0.032)	0.653	0.051(0.019, 0.083)	0.002	-0.051(-0.077, -0.026)	<0.001
PFOA	-0.037(-0.142, 0.068)	0.488	0.089(-0.041, 0.219)	0.177	-0.111(-0.216, -0.006)	0.039

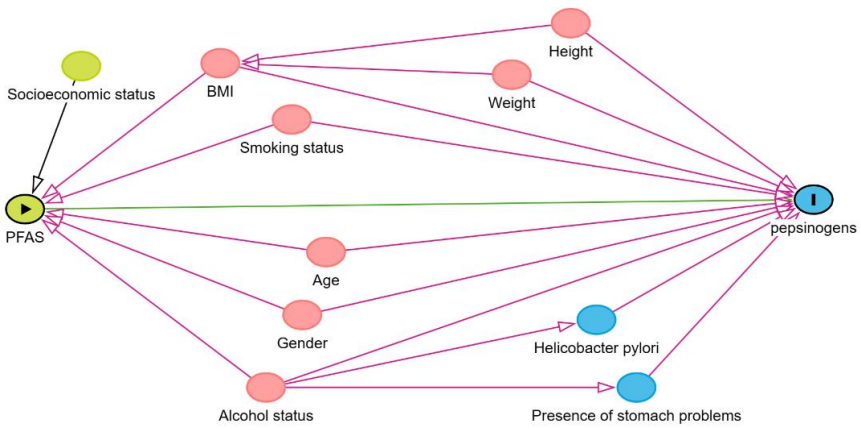
Note. [a]Adjusted for sex, BMI, smoking, alcohol status. Abbreviations: PFAS, per- and

polyfluoroalkyl substances; HFPO-DA, hexafluoropropylene oxide-dimer acid; PFDA, Perfluoro-n-decanoic acid; PFDoA, Perfluoro-n-dodecanoic acid; n-PFHxS, Potassium perfluorohexanesulfonate; br-PFHxS, Sum of all branched isomers PFHxS; PFNA, Perfluoro-n-nonanoic acid; PFOA, perfluorooctanoic acid; PGI, pepsinogen I; PGII, pepsinogen II; PG I/II, pepsinogen I/II.

Supplementary Table S11. Posterior inclusion probabilities (PIP) derived from Bayesian kernel machine regression models

All subjects	**PGI**	**PGII**	**PG I/II**
	groupPIP	groupPIP	groupPIP
HFPODA	0.00320	0.00736	0.01480
PFDA	0.14352	0.02184	0.00096
PFDoA	0.02928	0.00776	0.75128
n-PFHxS	0.01768	0.01816	0.00384
br-PFHxS	0.09536	0.09328	0.79256
PFNA	0.00496	0.93168	0.23688
PFOA	0.01288	0.04704	0.05392

Note. Abbreviations: PFAS, per- and polyfluoroalkyl substances; HFPO-DA, hexafluoropropylene oxide-dimer acid; PFDA, Perfluoro-n-decanoic acid; PFDoA, Perfluoro-n-dodecanoic acid; n-PFHxS, Potassium perfluorohexanesulfonate; br-PFHxS, Sum of all branched isomers PFHxS; PFNA, Perfluoro-n-nonanoic acid; PFOA, perfluorooctanoic acid; PGI, pepsinogen I; PGII, pepsinogen II; PG I/II, pepsinogen I/II.

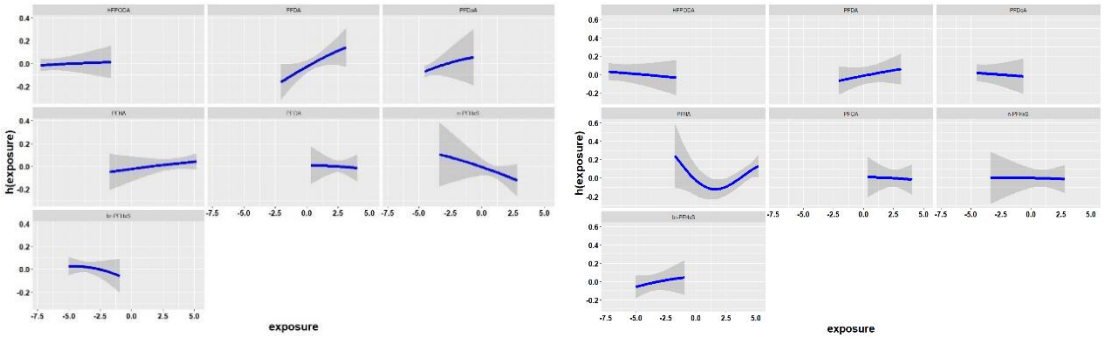


Supplementary Figure S1. Directed acyclic Ggraph for covariate selection.

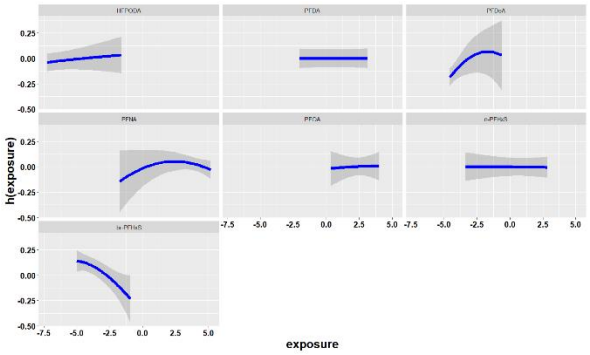
Supplementary Figure S2. Spearman correlation coefficients between the seven PFAS.

A

B



C



Supplementary Figure S3. Exposure–response plots (95% credible intervals) for associations between pepsinogens and in-transformed concentrations of individual PFASs when all other PFASs are fixed at their median concentrations. Estimates are from BKMR models adjusted for gender, age, BMI, smoking status, alcohol status. A) in PG I; B) in PG II; C) in PG I/II. Abbreviations:

PFAS, per- and polyfluoroalkyl substances; HFPO-DA, hexafluoropropylene oxide-dimer acid; PFDA, Perfluoro-n-decanoic acid; PFDoA, Perfluoro-n-dodecanoic acid; n-PFHxS, Potassium perfluorohexanesulfonate; br-PFHxS, Sum of all branched isomers PFHxS; PFNA, Perfluoro-n-nonanoic acid; PFOA, perfluorooctanoic acid; PGI, pepsinogen I; PGII, pepsinogen II; PG I/II, pepsinogen I/II.