

INTRODUCTION

- Beaver County, ~20 miles NW of Pittsburgh has a history of industrial manufacturing, including glass and steel production.
- Currently the Ohio River Valley is home to the following kinds of industries:
 - polyethylene cracking
 - polystyrene manufacturing
 - chemical/ agrochemical and
 - Iron and steel part manufacturing.
- Prior study in the area conducted between July 2022- July 2023 found:
 - Elevated PFAS levels in surface water (Ohio R.) air and soil. (*unpublished data*)
 - Community Perceptions of Health Risks- high concern about current and future exposure to pollution [1]

2025

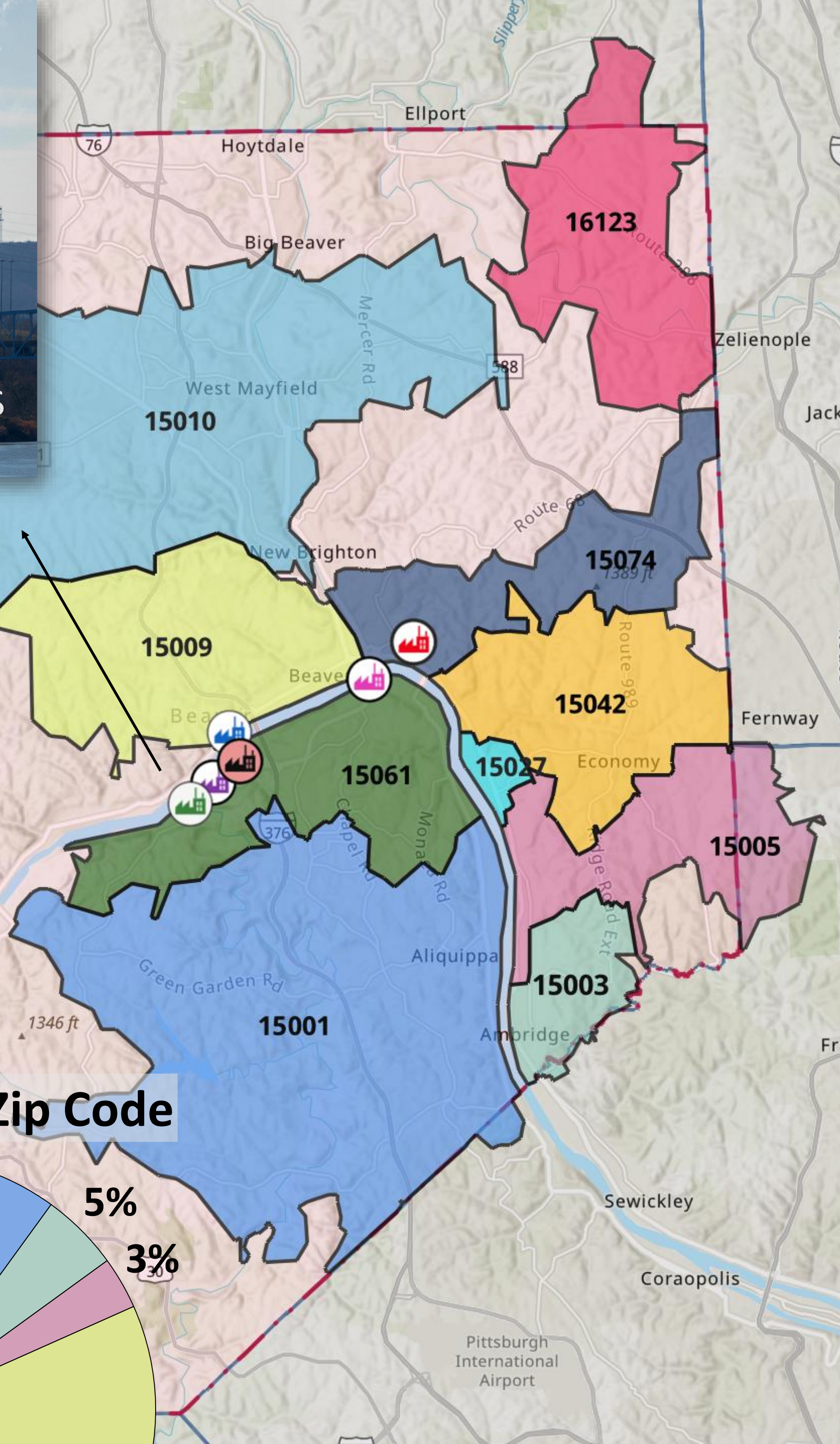
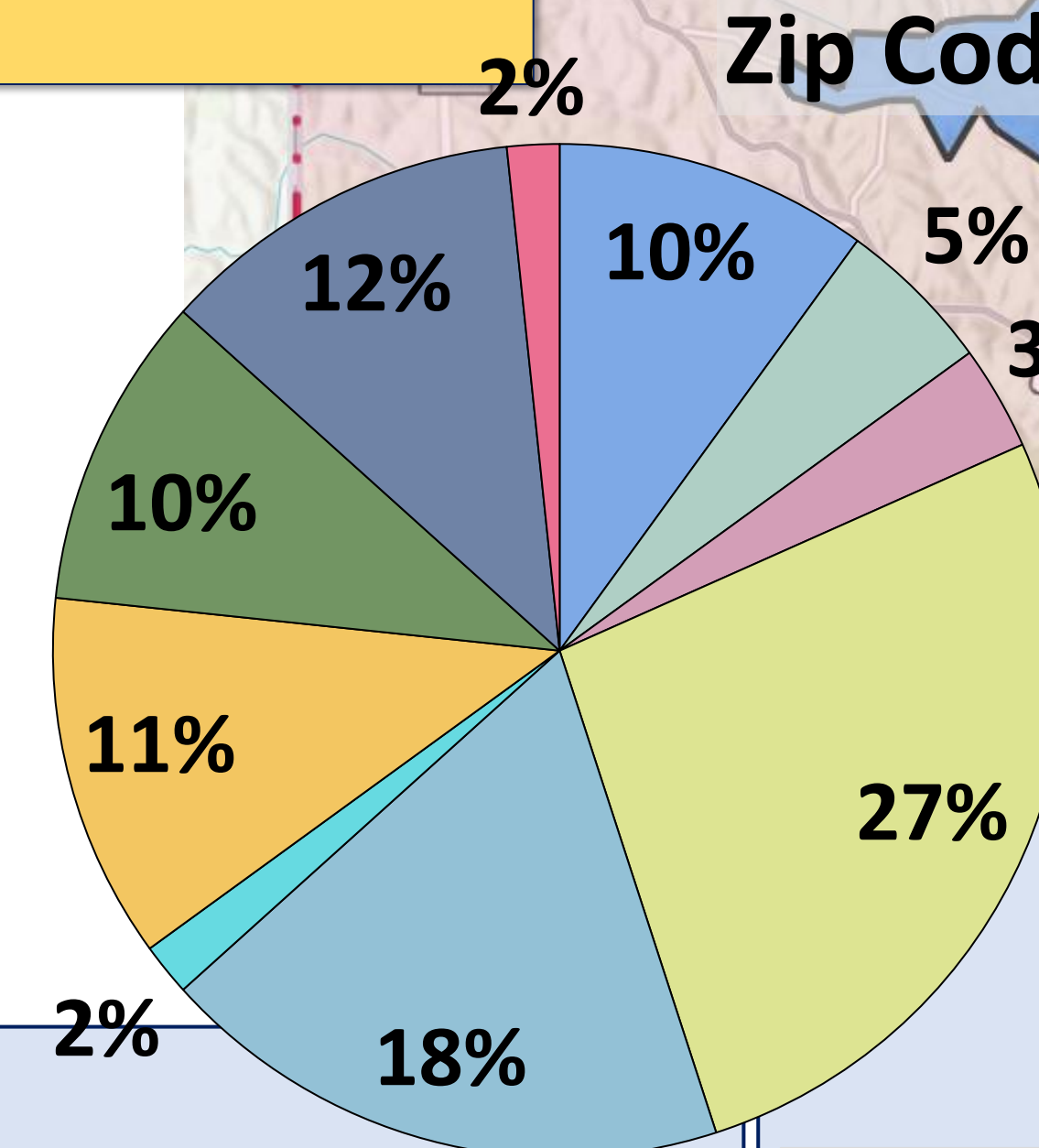


Polyethylene Cracking Plant in Monaca, PA (2022-Present):

- 15 PA DEP air-quality violations
- VOC 12-month cap hit in 6 months
- \$10 M fine and a 2-month repair shutdown.

% Distribution of 60 residents across 10 Zip Codes in Beaver Co, PA.

- 15001
- 15003
- 15005
- 15009
- 15010
- 15027
- 15042
- 15061
- 15074
- 16123



STUDY SITE / AIM

- Community-engaged air and dust sampling conducted **between Sep-Dec 2024** to estimate exposures of PFAS for the residents.
- A total of **60 residents living across 10 Zip Codes** in Beaver Co, PA, were sampled.

METHODS



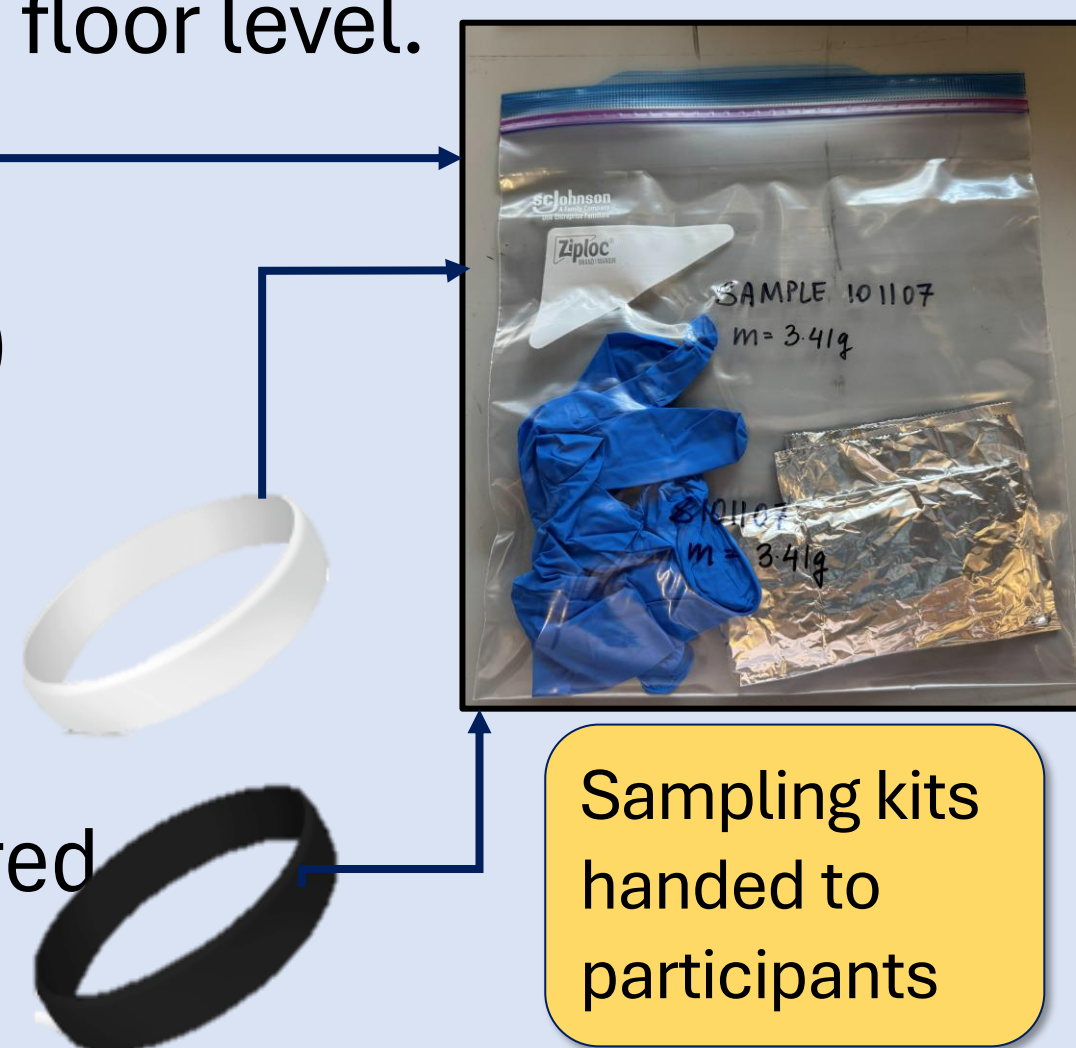
- Pitt researchers met participants at a clinic in Monaca, PA.
- On-site blood collection was done using Eurofins blood kit.**

- Sampling kits distributed to participants and consent forms signed.
- Blood samples shipped to Eurofins lab for analysis within 7 days of collection.



- Swiffer dust wipes (pre-weighed)** packed in aluminum foils. Participants collected dust samples by wiping horizontal surfaces at least 1 meter above the floor level.

- Two sets of wristbands (treated by baking at 280 °C for 4 hours and packing them in individual aluminum foils [2]) were used for air sampling:

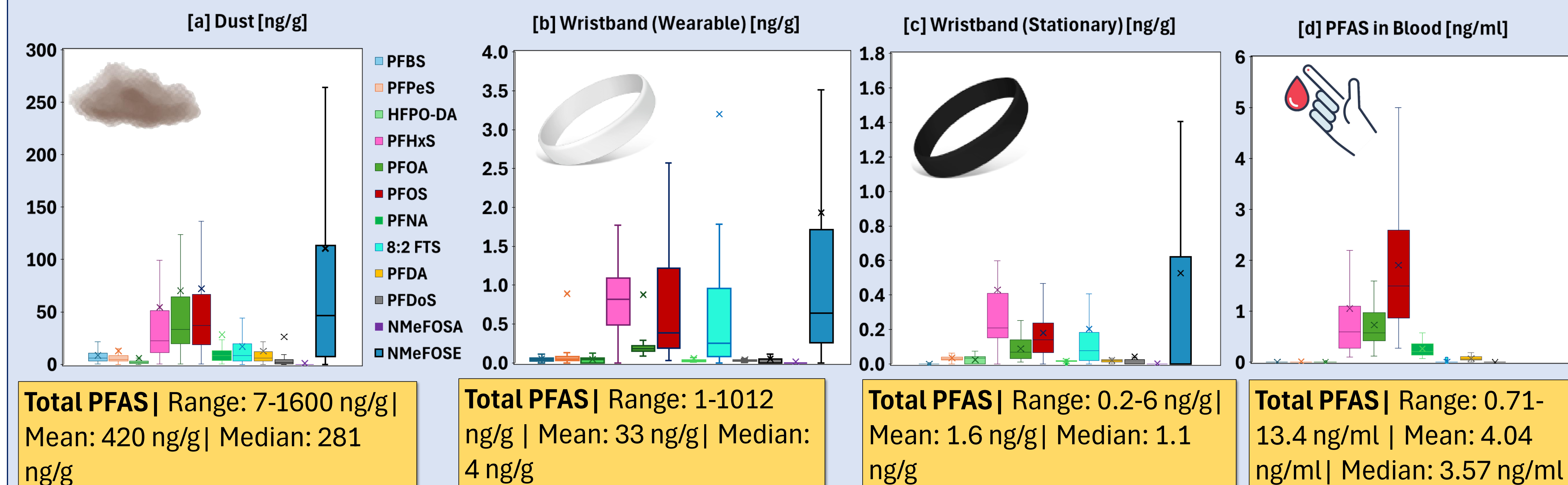


- Wearable (White)**- participants wore these for 7 continuous days.
- Stationary (Black)**- participants left these uncovered in the bedroom for 7 days.

- Participants packed dust wipes/ wristbands in new foil after sample collection and shipped in prepaid mailers to the Pitt lab.
- Dust-wipes extracted for PFAS only. Wristbands were cut in half: one half analyzed for PFAS (another half stored at -20 deg C for future SVOC analysis)
- PFAS analysis: EPA 1633 using Thermo Fisher Vanquish Flex UHPLC equipped with TSQ Quantis™ Triple Quadrupole Mass Spectrometer. Blood analysis by Eurofins.**

RESULTS/ DISCUSSION

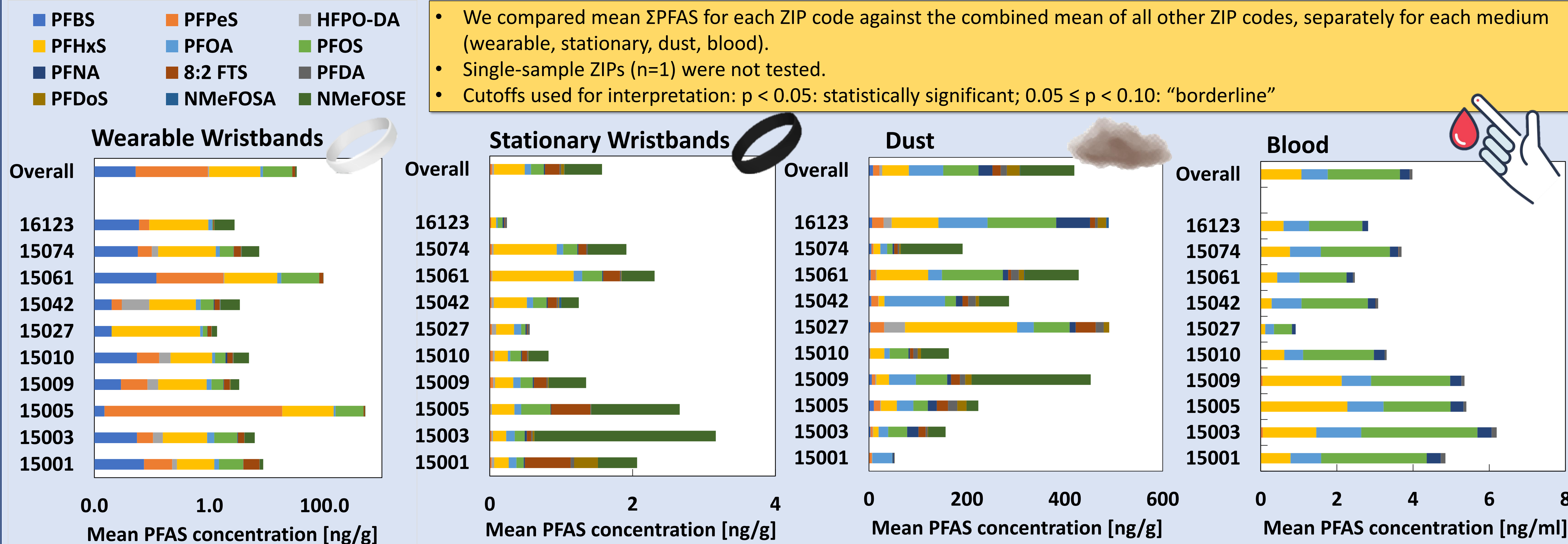
1. Which chemicals are dominant contributors to overall PFAS exposures? What is the range of exposure in air and dust across ~60 households?



2. How do blood concentrations compare with NHANES levels?

	Year	PFOA	PFOS	PFNA	PFHxS	PFDA	Overall, geometric means of PFAS blood levels [ng/ml] across 60 participants in Beaver Co, PA were lower than 2018 NHANES levels.
NHANES	2015-2016	1.560	4.720	0.577	1.180	0.154	
	2017-2018	1.420	4.250	0.411	1.080	0.193	
Beaver Co, PA (this study)	2024	0.596	1.458	0.218	0.626	0.085	

3. How do PFAS concentrations vary geographically across Zip Codes for different media? Which areas stand out significantly than others?



Medium	ZIPs with conc.<mean (p < 0.05)	ZIPs with conc.>mean (p < 0.05)	Borderline differences (0.05 ≤ p < 0.10)	Take-Aways
Wearable ΣPFAS	—	—	—	No ZIP shows a significant difference (all p > 0.13). Outliers in 15005/15061 but very small n and high variance → no clear ZIP-level difference.
Stationary ΣPFAS	15010 (lower; p = 0.002)	15005 (higher; p = 0.048, n = 2)	—	15010 appears consistently lower. 15005 elevated but based on only two homes.
Dust ΣPFAS	15003 (lower; p = 0.004, n = 2)	—	—	Dust from 15003 homes shows much lower ΣPFAS than the rest of the study area; result is still based on small n.
Blood ΣPFAS	15061 (lower; p = 0.014)	—	15009 (higher; p = 0.065)	Participants in 15061 have lower blood ΣPFAS. 15009 shows a trend toward higher blood ΣPFAS but is only borderline significant.

CONCLUSIONS

- Total PFAS in most ZIPs are not significantly different from the region-wide mean for any medium.
- A few ZIPs show potential “hot” or “cool” spots, depending on medium:
 - Lower ΣPFAS:** 15010 (stationary), 15003 (dust), 15061 (blood)
 - Higher ΣPFAS:** 15005 (stationary, small n), 15009 (blood, borderline)
- Limitations of the study:
 - Several ZIPs have small sample sizes (n=2-7) and large variability.
 - We used total PFAS, which may mask analyte-specific patterns.
- Future work will examine:
 - Non-parametric significance tests
 - Analyte-specific patterns
 - Cross-media, cross-analyte correlations across geography
 - Prevailing wind-patterns that could affect airborne exposures in the region
 - Comparison with river data and ongoing outdoor air monitoring in region

REFERENCES

- Buchanich, Jeanine M., Hannah H. Covert, Rachel E. Macias, et al. “Community Perceptions of Health Risks Associated With a Petrochemical Plant in Beaver County, Pennsylvania.” *Journal of Environmental Health* 87, no. 9 (2025). <https://doi.org/10.70387/001c.137190>.
- Niu, Shan, Xinran Zhu, Ruiwen Chen, et al. “Personal Wearable Sampler for Per- and Polyfluoroalkyl Substances Exposure Assessment.” *Environmental Science & Technology Letters* 11, no. 4 (2024): 301-7. <https://doi.org/10.1021/acs.estlett.4c00026>.
- NHANES, ATSDR: <https://www.atsdr.cdc.gov/pfas/data-research/facts-stats/index.html>