Shih-Chun Pan (潘士群)

Research Center for Environmental Changes (RCEC), Academia Sinica
No. 128, Sec. 2, Academia Rd., Nankang, Taipei, Taiwan 115
Office Tel: +886-2-2787-5939
Email: scpan@as.edu.tw
Lab website link: www.rcec.edu.tw

EDUCATION

2013/09 – 2020/01 Ph.D. Institute of Environmental and Occupational Health Sciences, National Taiwan University, Taiwan
2009/09 – 2011/06 M.S. Depart. of Public Health, China Medical University, Taiwan
2005/09 – 2009/06 B.A. Depart. of Public Health, China Medical University, Taiwan

EMPLOYMENT

2026/02 - present Assistant Research Fellow
Research Center for Environmental Changes, Academia Sinica, Taipei, Taiwan
2024/08 – 2026/02 Postdoctoral Researcher
Environmental and Occupational Medicine, College of Medicine, National Taiwan University, Taipei, Taiwan
2020/02 - 2024/08 Postdoctoral Researcher
National Institute of Environmental Health Sciences, National Health Research Institutes, Miaoli, Taiwan
2011/08 – 2022/12 Research Assistant
Cancer Center, China Medical University Hospital, Taichung, Taiwan

RESEARCH INTEREST

My research focuses on environmental epidemiology, examining how environmental stressors—including air pollution, climate factors, and occupational exposures—affect health across the life course. I place particular emphasis on vulnerable populations, such as children, older adults, and pregnant women. By integrating advanced statistical methods with large-scale health databases and molecular biomarkers, I investigate both short- and long-term health effects and underlying biological mechanisms. My work adopts a multidisciplinary, life-course perspective to understand how environmental exposures influence cardiometabolic health during critical developmental and aging windows. I further incorporate heterogeneous data analytics and real-time monitoring technologies to improve exposure assessment and identify early physiological responses. Through collaboration with the Multi-Country Multi-City Collaborative Research Network, I contribute Taiwan-based data to global climate and health research. Ultimately, my goal is to develop predictive

indicators and mechanistic evidence that inform risk assessment, early prevention, and policy responses under a changing climate.

RESEARCH HIGHLIGHTS

Impact of Air Pollution Exposure on the Course of Diabetes

Our research is the first to systematically track the progress of diabetes from pregnancy to late-stage complications, revealing the significant impact of air pollution exposure on metabolic diseases. We found that exposure to air pollution during pregnancy not only significantly increases the risk of gestational diabetes, but also, after delivery, women who had gestational diabetes and continue to be exposed to polluted environments have a much higher risk of developing type 2 diabetes compared to those without gestational diabetes, highlighting the synergistic effect of air pollution and gestational diabetes on diabetes occurrence. In addition, we also demonstrated for the first time that exposure to air pollution in diabetic patients accelerates the development of diabetic retinopathy. These findings not only deepen the academic understanding of the interaction between environmental factors and metabolic diseases but also provide key scientific evidence for protective strategies for pregnant women and high-risk populations with diabetes, underscoring the major social contribution of improving air quality to reduce the burden of chronic diseases.

Taiwan-Specific Epigenetic Age and Air Pollution

I am dedicated to developing epigenetic health models and have successfully constructed an epigenetic age estimation model applicable to the Taiwanese population, demonstrating that long-term $PM_{2.5}$ exposure accelerates biological aging. By combining advanced multi-omics techniques such as DNA methylation with machine learning methods, we designed indicators that can quantify the impact of environmental exposures on physiological aging and chronic disease progression. We also found that individuals exposed to high concentrations of PM exhibit biological ages significantly older than their chronological ages. This study provides locally validated biomarkers, which help in the early detection of environmental health effects and support precision environmental epidemiology research.

REPRESENTATIVE PUBLICATIONS (*: corresponding author)

1. Huang CC, **Pan SC***, Chen PC, Guo YL (2025, Jul). Taiwan population-based epigenetic clocks and their application to long-term air pollution exposure. *Environ Res*, 277:121542.
2. Chen YC, **Pan SC**, Chin WS, Wu CD, Guo YL (2025, Jun). Long-term exposure to ambient air pollution and the incidence of nonalcoholic fatty liver disease: a cohort study. *Int J Epidemiol*, 54(4):dyaf101.

3. **Pan SC***, Chin WS, Huang CC, Chen YC, Wu CD, Hsu CY, Lin P, Chen PC, Guo YL (2025, Jan). Proximity to petrochemical industry and risk of childhood asthma occurrence. *Int J Hyg Environ Health*, 264:114515.
4. Chen SJ, **Pan SC***, Wu CD, Li H, Guo YL, Lin CH (2024, Dec). Long-term exposure to multiple air pollutants and risk of Parkinson's disease: a population-based multipollutant model study. *J Neurol Neurosurg Psychiatry*, 334825.
5. Huang CC, **Pan SC**, Chin WS, Hsu JF, Guo YL (2023, Dec). Urinary heavy metals and attention-deficit/hyperactivity symptoms of preschool children: a mixed-exposure analysis. *Ecotoxicol Environ Saf,* 268:115714.
6. Rai M, Stafoggia M, de'Donato F, Scortichini M, Zafeiratou S, Vazquez Fernandez L, Zhang S, Katsouyanni K, Samoli E, Rao S, Lavigne E, Guo Y, Kan H, Osorio S, Kyselý J, Urban A, Orru H, Maasikmets M, Jaakkola JJK, Ryti N, Pascal M, Hashizume M, Fook Sheng Ng C, Alahmad B, Hurtado Diaz M, De la Cruz Valencia C, Nunes B, Madureira J, Scovronick N, Garland RM, Kim H, Lee W, Tobias A, Íñiguez C, Forsberg B, Åström C, Maria Vicedo-Cabrera A, Ragettli MS, Leon Guo YL, **Pan SC**, Li S, Gasparrini A, Sera F, Masselot P, Schwartz J, Zanobetti A, Bell ML, Schneider A, Breitner S. (2023, Oct). Heat-related cardiorespiratory mortality: Effect modification by air pollution across 482 cities from 24 countries. *Environment International*, 174:107825.
7. **Pan SC***, Huang CC, Chen BY, Chin WS, Guo YL (2023, May). Risk of type 2 diabetes after diagnosed gestational diabetes is enhanced by exposure to $PM_{2.5}$. *Int J Epidemiol*, 52(5):1414-1423.
8. Liu C, Chen R, Sera F, Vicedo-Cabrera AM, Guo Y, Tong S, Lavigne E, Correa PM, Ortega NV, Achilleos S, Roye D, Jaakkola JJ, Ryti N, Pascal M, Schneider A, Breitner S, Entezari A, Mayvaneh F, Raz R, Honda Y, Hashizume M, Ng CFS, Gaio V, Madureira J, Holobaca IH, Tobias A, Íñiguez C, Guo YL, **Pan SC**, Masselot P, Bell ML, Zanobetti A, Schwartz J, Gasparrini A, Kan H. (2023, Oct). Interactive effects of ambient fine particulate matter and ozone on daily mortality in 372 cities: two stage time series analysis. *BMJ-British Medical Journal*, 383:e07520.
9. Chen YC, Chin WS, **Pan SC**, Wu CD, Guo YL (2023, Jan). Long-Term Exposure to Air Pollution and the Occurrence of Metabolic Syndrome and Its Components in Taiwan. *Environmental Health Perspectives*, 131(1):17001.
10. Liu C, Cai J, Chen R, Sera F, Guo Y, Tong S, Li S, Lavigne E, Correa PM, Ortega NV, Orru H, Maasikmets M, Jaakkola JJK, Ryti N, Breitner S, Schneider A, Katsouyanni K, Samoli E, Hashizume M, Honda Y, Ng CFS, Diaz MH, Valencia CC, Rao S, Palomares AD, Silva SPD, Madureira J, Holobâc IH, Fratianni S, Scovronick N, Garland RM, Tobias A, Íñiguez C, Forsberg B, Åström C, Vicedo-Cabrera AM, Ragettli MS, Guo YL, **Pan SC**, Milojevic A, Bell ML, Zanobetti A, Schwartz J, Gasparrini A, Kan H. (2022, Jun). Coarse Particulate Air Pollution

and Daily Mortality: A Global Study in 205 Cities. *Am J Respir Crit Care Med*, 206(8):999-1007.

11. Chin WS, **Pan SC**, Huang CC, Chen PJ, Guo YL (2022, Jun). Exposure to Air Pollution and Survival in follow-up After Hepatocellular Carcinoma. Liver Cancer, 11(5):474-482.
12. Huang CC, **Pan SC**, Chin WS, Chen YC, Wu CD, Hsu CY, Lin Pinpin, Chen PC, Guo YL (2022, May). Living proximity to petrochemical industries and the risk of attention-deficit/ hyperactivity disorder in children. *Environ Res*, 212(Pt A):113128.
13. Chin WS, **Pan SC**, Huang CC, Chen YC, Hsu CY, Lin Pinpin, Chen PC, Guo YL (2022, May). Proximity to petrochemical industrial parks and risk of chronic glomerulonephritis. *Environ Res*, 208:112700.
14. Huang CC, **Pan SC**, Chin WS, Chen YC, Hsu CY, Lin Pinpin, Guo YL (2021, Mar). Maternal proximity to petrochemical industrial parks and risk of premature rupture of membranes. *Environ Re*, 194; 110688.
15. **Pan SC***, Huang CC, Chin WS, Chen BY, Chan CC, Guo YL (2020, Feb). Association between air pollution exposure and diabetic retinopathy among diabetics. *Environ Res*, 181:108960.
16. **Pan SC***, Huang CC, Lin SJ, Chen BY, Chan CC, Guo YL (2017, Oct). Gestational diabetes mellitus was related to ambient air pollutant nitric oxide during early gestation. *Environ Res*, 158:318-323.

Others (Invited Talks，Keynote speech et al.)