

Exploring Child Development, Health, and Environments: Insights from the Kids in Taiwan (KIT) Longitudinal Study

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The Kids in Taiwan: National Longitudinal Study of Child Development and Care (KIT) is a multi-disciplinary longitudinal survey project focusing on early childhood development in Taiwan. Supported by the National Science and Technology Council and executed by National Taiwan Normal University, the project tracks two nationally representative cohorts initially sampled at 3 months (6,588 children, wave 1) and 36 months (2,164 children, wave 1) of age. Guided by ecological systems and life course theories, the KIT database systematically collects comprehensive data on children's health, cognitive, language, socio-emotional, and motor/physical development, alongside their family, childcare, and school environments. Furthermore, the project incorporates Geographic Information System (GIS) data to analyze the spatial and environmental contexts shaping children's growth. The introduction of this symposium will provide a succinct overview of the KIT project, covering aspects such as its sample structure, survey waves, and its core goal of serving as a national data asset for academic research and policy-making.

In the first talk, the presenter will share applications of the KIT database on exploring maternal depression trajectory heterogeneity and its longitudinal predictions of children's development. Utilizing seven waves of data from the 3-month cohort, this study applies finite mixture modeling to identify distinct latent sub-populations of maternal depression from childbirth to preschool age. The talk will highlight how different trajectory parameters (such as initial status and rate of change) conditionally predict children's cognitive and socio-emotional outcomes, and how child gender acts as a critical predictor and moderator. Furthermore, it will address the methodological importance of appropriate model selection and error-correction strategies to capture "change within change" accurately.

In the second talk, the presenter will examine the associations between zBMI growth rates across distinct developmental periods and pubertal development, and evaluate whether sleep duration mediates this relationship, with attention to sex-specific and sequential pathways. Using repeated height and weight data from 3,843 KIT children tracked from birth to age 8, the study examines BMI z-score growth rates across early developmental stages. The findings demonstrate distinct sex-specific patterns: faster zBMI growth is directly associated with more advanced pubertal development in girls, whereas in boys, this relationship is indirect and mediated by shorter sleep duration. This study underscores the need to consider sex differences and developmental timing when designing early preventive health interventions targeting early pubertal development.

In the third talk, the presenter will introduce an application of the KIT data combined with GIS environmental data, evaluating the joint effects of ambient air pollution mixtures on allergic rhinitis among four-year-old children. By applying a novel Quantile G-Computation approach to a sample of 6,193 children, the study effectively handles complex, highly correlated multi-pollutant exposures like PM_{2.5}, NO₂, and O₃. The presentation will reveal striking regional heterogeneities: while traffic-derived NO₂ is the predominant risk driver nationwide, children in Northern Taiwan face a statistically significant positive joint effect from the pollution mixture, whereas those in Southern Taiwan face an escalated, secondary threat specifically driven by PM_{2.5}. This application highlights the exceptional value of integrating the KIT dataset with spatial data to offer localized, precision-driven evidence for public health and environmental policies.