China Kadoorie Biobank: Opportunities in environmental health research

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Rapid economic development and social re-organisation in low- and middle-income countries (LMICs) have resulted in drastic impacts on natural- and built-environment, individual behaviour, and an epidemiological transition leading to the predominance of non-communicable diseases as a major cause of death and disability.

Despite substantial effort in promoting clean household energy use, economic development has resulted in significant increases in industrial and vehicular emissions in many emerging economies. Subsequently, ambient and household air pollution together constitute the leading environmental cause of premature death and disability, disproportionately affecting LMICs where the majority of the associated 6.1 million deaths in 2016 occurred.

Individual lifestyle and behaviour are likely to be, at least partly, determined by attributes of the built-environment at individual and neighbourhood levels, including density, design, physical configuration. How the complex interactions between individuals and environment may influence health and well-being is not clearly understood, especially in LMICs, which is critical to inform and advocate for appropriate policy interventions to tackle such challenges. Well-established large-scale prospective cohort studies in LMIC populations, such as the China Kadoorie Biobank (CKB) offer unique opportunities to address the knowledge gaps.

The CKB was established jointly by the Chinese Academy of Medical Sciences and University of Oxford in 2004-2008, during which 0.5 million adults were surveyed and provided blood samples. The baseline survey collected detailed information on socio-demographic, socio-economic, lifestyle, environment, reproductive, and psychosocial factors as well as medical history and anthropometric measurements. The availability of blood samples allows multi-omics approach of exposure-disease investigation. Record linkages to established death and disease registries and national health insurance databases enable comprehensive and cost-efficient long-term follow-up for cause-specific hospitalisation and death events.

Leveraging the existing infrastructure and resources of CKB, and the diverse spectrum of built-environments in China, from rural communities relying on burning coal and wood for cooking to modern but heavily polluted megacities, an initiative was founded in 2015 to establish a research platform to assess health effects of air pollution in China. Pipelines are currently being developed for "next-generation" exposure assessment methods to accurately quantify personal exposure to air pollution and the associated health risks. Further collaborations are welcome to expand the scope into other areas of environmental health research.