Application number/Title: 50538 - Relationships between blood, urinary and other biomarkers and risk of human non-communicable diseases, all-cause mortality, and cause-specific mortality

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Keywords provided by the Applicant PI to describe the research project: biomarker, causal inference, cohort study, mortality, non-communicable disease, phenome-wide association study

Application Lay Summary:

Non-communicable diseases (also known as common diseases or complex diseases) are the largest cause of deaths in the world. Biomarkers are commonly used as indicator of diseases or to predict risk and outcome of diseases. Epidemiological studies have linked numerous biomarkers with risk of non-communicable diseases. However, most of the studies are cross-sectional studies or case-control studies with a small sample size and results have not been confirmed in large perspective cohort studies. Meanwhile, while most studies focused on major non-communicable diseases, virtually no studies have been done to systematically evaluate the relationships between biomarkers and risk of all non-communicable diseases and mortality. Furthermore, observational studies can identify epidemiological associations between biomarkers and risk of non-communicable diseases. However, whether these biomarkers directly cause the studied diseases or are just a risk factor for them are largely unknown due to the presence of reverse causation and confounding. This question has clinical significance since biomarkers may be translated into prevention and treatment of non-communicable diseases if associations between these biomarkers and the diseases are causal. In this project, we aim to comprehensively investigate associations between blood, urinary and other biomarkers and risk of non-communicable diseases (all ICD10 disease categories), all-cause mortality, and cause-specific mortality, and examine whether the epidemiological associations identified in prospective observational analyses are causal. To address these issues, we will conduct a prospective observational analysis, a genome-wide association analysis, a phenome-wide association analysis and a Mendelian
randomization analysis, as well as a series of secondary analyses using data from UK Biobank. We will start analyses as soon as data are available and plan to finish this project and send manuscripts to authors for review within 36 months after we receive the data. We hope that our study will provide a landscape of epidemiological and causal relationships between biomarkers and risk of non-communicable diseases, all-cause mortality and cause-specific mortality and may help identify novel biological pathways and therapeutic targets for improving prevention and treatment of human non-communicable diseases. The aim of our project is consistent with the goal of UK Biobank that devotes to improving the prevention, diagnosis and treatment of a wide range of serious and life-threatening illnesses like non-communicable diseases.