Tianjin Diabetes and Health Cohort Study

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Research Protocol：

This study establishes a multidimensional dynamic cohort research platform leveraging comprehensive medical and healthcare data from approximately 400,000 diabetes patients in Tianjin during 2009-2023. Focused on addressing critical scientific challenges in diabetes prevention and management, the project employs advanced analytical methods to extract insights from multi-parametric data sources including electronic health records, medical imaging, and wearable device metrics.

Diabetes mellitus represents a significant global public health challenge, with its prevalence exhibiting rapid growth in China. Tianjin, serving as the medical hub of the Beijing-Tianjin-Hebei region, possesses a unique advantage through its network of secondary and tertiary hospitals that have systematically accumulated longitudinal medical data. This comprehensive dataset provides an invaluable resource for investigating the spatiotemporal patterns of diabetes epidemiology. In this study, we aim to establish a standardized data integration platform and develop innovative analytical algorithms. Leveraging the Tianjin Diabetes Population Cohort, we will construct an end-to-end research framework encompassing: disease risk prediction models, clinical decision

support systems, and health policy evaluation methodologies.

The research program comprises five synergistic modules designed to provide comprehensive insights into diabetes epidemiology.

The prevalence trends module systematically analyzes the epidemiological characteristics of diabetes and its associated risk factors, while conducting comparative studies with global datasets to establish an evidence-based foundation for researchers worldwide.

In the pathogenesis module, we will investigate the etiological mechanisms, risk factors, early biomarkers, and disease progression of diabetes mellitus and elucidate potential therapeutic targets for diabetes prevention and clinical intervention.

In the risk prediction module, we will develop advanced machine learning ensemble models to identify high-risk populations for diabetes onset, predict the critical diabetic complications including diabetic nephropathy, retinopathy progression, cardiovascular diseases, and assess the life expectancy.

In the personalized treatment and management module, we will systematically quantify the longitudinal effects of dynamic

glycemic control fluctuations on disease-specific risks and all-cause mortality, investigate medication dosing regimens and prescription patterns in relation to glycemic target achievement, and establish robust clinical evidence to standardize management protocols and optimize tiered care delivery systems for diabetes mellitus.

In the health economics module, we conducted a comprehensive evaluation of diabetes-associated health and economic burdens in Tianjin and developed disease burden trajectories models for temporal trends projection. Furthermore, we performed rigorous health economic evaluations of diabetes interventions through Markov decision-analytic modeling and microsimulation techniques to identify cost-effective diabetes management strategies.

Through the systematic integration of multi-dimensional data, this study will establish a comprehensive closed-loop research framework encompassing risk prediction, clinical intervention, and economic evaluation. This integrated approach will generate region-specific evidence to support precision diabetes prevention and control strategies in the local context.