

## Foreword

## Using Healthcare Big Data Analytics to Improve Women's Health: Benefits, Challenges, and Perspectives

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Women's health is of paramount importance for the attainment of the Sustainable Development Goals (SDGs) and Healthy China 2030, encompassing reproductive health and physical and mental well-being. This multifaceted concept of health is integral to the health of maternal, newborn, child, adolescent, and adult populations (1–3). Despite China's substantial achievements in diminishing maternal and child mortality rates over the last thirty years, there remain several under-addressed aspects of women's health, including preconception and menopause care, adolescent health, reproductive cancers, sexually transmitted infections, and mental health (4–5). Additionally, sociocultural determinants such as societal norms, income disparities, power dynamics, and prejudiced attitudes from family and society can disproportionately impact women's health outcomes. The scarcity of healthcare resources has led to a dearth of research on women's health, resulting in limited evidence-based insights. This gap in knowledge hinders the formulation and execution of effective health policies and interventions.

This special issue comprises a collection of articles emphasizing the application of big data analytics in two primary domains: disease monitoring and risk factor identification. These studies utilized data drawn from population-wide screening and surveillance initiatives in actual clinical environments. Each piece of research incorporated, to varying degrees, the principles and techniques of healthcare big data analytics, specifically within the sphere of women's health. Liu et al. explored fluctuations in anemia prevalence across various levels of severity among women aged 18 years and above in 2021, utilizing a vast screening database. This database comprises data on over six million women from approximately 70% of the prefecture-level cities within all 31 provincial-level administrative divisions (PLADs) of Chinese mainland (6). Sun et al. scrutinized the incidence and mortality rates associated with five types of female genital cancers in 2022, examining their evolutionary trends (7). Due to the exponential expansion of China's cancer registry data across volume, diversity, and speed, there's a burgeoning necessity for advanced big data analytics. Yang et al. uncovered a correlation between preterm births and preconception alanine aminotransferase concentrations in a cohort of over five million women of childbearing age, drawn from the National Free Preconception Checkups Project — a database that stands as China's most extensive in terms of pregnancy-related data (8). Zhang et al. investigated the occurrence of multiple reproductive tract infections and their links to HPV infection, integrating data from various clinical databases across six hospitals (9). This special issue aims to underscore the transformative power of healthcare big data and its associated technologies in enhancing women's health outcomes.

While the use of big data in women's health is on the rise in China, it remains in a nascent stage, and evidence to substantiate the impact of big data analytics on enhancing women's health outcomes is scarce (10). At the time of preparing this issue, a search in PubMed yielded 11,598 articles with “big data” in the title over the past five years, of which merely 10% pertained directly to women's health. It is crucial to acknowledge and address the principal challenges hindering the application of big data in this field. Common obstacles mirror those encountered in other sectors, such as inconsistency in medical terminology, biased sampling and selection, confounding factors, and the tendency to overfit predictive models. Additionally, health professionals grapple with the surge of data in clinical settings and struggle to determine the optimal utilization of this information for guiding patient care. Furthermore, the sensitivity of women's status in social culture mandates careful consideration of privacy, consent, data security, and associated ethical and legal issues in the application of big data. Notably, current evidence, derived from studies employing risk models or observational approaches, indicates only a slight, if any, improvement in accuracy over traditional methods (11). Looking ahead, research predicated on big data should not only encompass women's health but also extend across the entire lifespan through more comprehensive data integration. Prioritizing the synthesis of evidence from big data analytics with clinical and population health practices is essential to truly advance women's health.

doi: [10.46234/ccdcw2024.035](https://doi.org/10.46234/ccdcw2024.035)# Corresponding authors: Hui Liu, [liuhui@pumc.edu.cn](mailto:liuhui@pumc.edu.cn); Linhong Wang, [linhong@chinawch.org.cn](mailto:linhong@chinawch.org.cn).<sup>1</sup> Institute of Medical Information, Chinese Academy of Medical Sciences & Peking Union Medical College, Beijing, China; <sup>2</sup> National Center for Chronic and Non-communicable Disease Control and Prevention, Chinese Center for Disease Control and Prevention, Beijing, China; <sup>3</sup> Women's Health Care Branch, Chinese Preventive Medicine Association, Beijing, China.

Submitted: January 25, 2024; Accepted: February 26, 2024

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