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Assessing the midwifery workforce demand: Utilising *Birthrate Plus* in China

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ABSTRACT

Objective: To assess the ability of the *Birthrate Plus Workforce Planning Methodology* (BR+) to forecast midwifery workforce demand in Chinese settings.
Design: A retrospective analysis of medical records.
Setting: ten hospitals in Beijing District.
Methods: Hospitals were selected using stratified sampling methods. The client category and midwife hours in each hospital were analysed over 1 month in consecutive three years (2013, 2014, and 2015).
Findings: Client category allocation varied between different hospital levels; Clients in higher category tended to need longer midwife hours; Mean birthrate of the ten hospitals was 154.30 (SD=40.700). Seven out of the ten hospitals were in need of more midwives.
Conclusions: Birthrate Plus was proved to be effective and efficient in Chinese settings; Gaps between available and needed midwives were large and prevalent in Chinese hospitals.

Introduction

Women's and children's health is regarded to be crucial to public health globally. Over the past two generations, China has achieved great improvements in women's and children's health. According to the National Health and Family Planning Commission of the People's Republic of China (NHFPC), the maternal mortality rates (MMR) dropped from 80.0 per 100,000 in 1991 to 24.5 per 100,000 in 2012, with the rate of 22.2 in the urban area and 25.6 in the rural area, respectively (NHFPC, 2013). Despite the decline in the MMR, there is still a big gap between China and the developed countries. For example, compared with Sweden, Singapore and Japan where the MMR is between 4 and 6 per 100,000 (NHFPC, 2013), China still has a long way to go.

Growing evidences have implied that the implementation of an effective intrapartum-care strategy is an overwhelming priority in reducing the MMR (Alkema et al., 2016; Campbell and Graham, 2006; Ten Hoope-Bender et al., 2006). According to the Lancet Maternal Survival Series Steering Group, most maternal deaths occur during labour, delivery, or the first 24 h postpartum (Carine and Wendy, 2006), when midwives are supposed to be in support. Additionally, several countries have witnessed a 50% drop of the MMR in the late 19th century, mostly through the provision of the professional midwifery care at birth (Carine and Wendy, 2006).

Another big challenge for China's maternal care is the highest cesarean section (CS) rate around the world. A global survey on the delivery modes and outcomes conducted by WHO showed that among the 24 involving countries in Asia, Africa and South America, China has the highest CS rate of 46.5% (Pisake et al., 2010), even up to 68% in some hospitals. When resources are scarce, cesarean sections that are not medically indicated could represent serious resource drain (Pisake et al., 2010) and poor perinatal outcomes (Mary et al., 2014). One of the most important reasons of the high CS rate is the absence or elimination of midwifery care (Mary et al., 2014).

Unfortunately, the number of midwives for every 1000 Chinese is only 0.03, far below that of the developed countries, and even that of nearly all the developing countries in Asia, such as Cambodia, Malaysia, Mongolia, the Philippines, and Vietnam (Pang, 2010). In addition, due to the most recent advocacy of the China's Two-child Policy and subsequently increased fertility rate, a "Baby Boom" is expected to come up around Year 2018, with its peak in 2026, which is and will definitely further stress out the already limited midwifery workforce (Zhai et al., 2014).

Such a desperate shortage of midwifery workforce has drawn attention of the decision-makers. For example, in the *Outline for the Development of Chinese Women and Children (2011–2020)*, the urgent need to strengthen midwifery workforce was addressed. Moreover, the *13*th *Five-Year Plan* of the Chinese government also

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calls special attention to maternal health care. Midwives, as a critical component of a functioning health system, take main responsibilities in maternal health care. In case of shortage or surplus of midwifery workforce, it is essential to make exact demand prediction of the midwifery staffing numbers.

However, there is no existing workforce planning methodology for the midwifery staffing members in China to address the unique scenario in the country. Globally, *Birthrate Plus Workforce Planning Methodology* (BR+), which is designed to assess the numbers of midwives required to match the standard care during labour, was often utilised in midwifery workforce projection (Jean et al., 2003a; Jean et al., 2003b; Jean et al., 2003c). Strength of BR+ lies in its score system, which utilises extensively validated clinical indicators of the process and labour outcome to produce five categories of outcomes, avoiding the estimation by "top down" methods of calculating staff members in relations to bed occupancy, or the method of hospital patients. Since 2001, BR+ has been implemented in over 200 maternity services of widely differing sizes and settings in the United Kingdom, Eire and New South Wales Australia, regarded as 'the gold standard' for maternity care (Jean and Marie, 2010a). However, BR+ has not yet been applied in China or other countries in Asia.

In China, the midwives can only practice in the labour wards while antenatal care being provided by obstetricians and postnatal care being provided by obstetrics nurses, which was stated clearly in the *Responsibilities of Working Staff in Hospitals* issued by the former Chinese Ministry of Health (Cheung, 2009; Gao et al., 2013; Zhu et al., 2015). In addition, there are no midwifery services at the community level in China. Therefore, this study aims to apply BR+ to predict the midwifery staffing demands in the labour wards of the hospitals through identifying the two elements of BR+ (the client category and the midwife hours), thereby to provide empirical evidence for strategic decision-makers.

Methods

A retrospective study of medical records was used to investigate client category and midwife hours. Following the analysis of these data, BR+ operation was applied to make need projection of midwifery staffing numbers.

Sampling

On the basis of the estimation of annual births of each hospital, ten hospitals were selected by a stratified sampling method. According to the statistics on Beijing Health Information Website, there were 80 tertiary hospitals (37.3%) and 134 secondary hospitals (62.6%) in Beijing, which provide midwifery services (there are no midwifery services in the community-level hospitals). On the basis of this proportion, the total of ten hospitals were selected (Table 1), comprising of 4 tertiary hospitals (3 general hospitals and 1 maternal and children's hospital) and 6 secondary hospitals (5 general hospitals and 1 maternal and children's hospital).

Table 1
Stratified sampling of hospitals.

Types of hospital	Numbers*(*n*)	%	Sample numbers(*n*)
Tertiary hospitals	80	37.3	4
Secondary hospitals	134	62.6	6
Total	214	100.0	10

* Reference: Beijing Health Information Website May 2014.

Data collection

Comprehensive and systematic review of medical records and surveys based on standardised questionnaires were administered for data collection, which was conducted from March to October, 2015. The inclusion criteria were as follows: the medical records of normal delivery and the emergency CS clients. Potential participants were excluded if: medical records of selective CS clients.

Data were collected via Birthrate Plus Questionnaire, including: (1) general information of clients: age, times of pregnancy and parity, past medical history, complication, time spent in the delivery suite from admission in labour to leaving with her baby for postnatal care, or to heading for operating room; and (2) score system:interventions during pregnancy (5 items), delivery conditions (2 items), neonatal conditions (3 items), other intensive care (4 items).

With the approval from Jean Ball, score system in BR+ was used as a basis to develop a system suitable to Chinese conditions through worldwide literature review and expert discussion. A pilot study was carried out with around 40 clients in a hospital to check whether the questionnaire was understandable and practical. According to the score system in BR+, the total score of each client was calculated by adding partial scores obtained on each item together. The total score ranged from 6 and above, allocating clients to one of the five categories. For example, a client who got a score of 9 belongs to Category II and 19 belongs to Category V. In BR+, clients in Category I–II are supposed to be in natural process of delivery, in no need of intervention, thus clients of these two categories are put together for comparison (Jean and Marie, 2010c).

The study protocol was approved and reviewed by Peking University Institutional Review Board. Before the study, the institutions from which data were collected were notified to acquire and analyse patient outcomes. No patient identifiable information was used in the study.

Data analysis

All the data was entered into an EPIDATA database (version 1.0). The data were checked for accuracy and completeness prior to any analysis. Data were analysed using the SPSS software (version 19.0). Categorical data were analysed using the Chi-squared test. Continuous data were analysed using *t*-test. All tests were two-tailed and significance was set at $P < 0.05$.

Operation formula

Midwifery staffing member demand = ∑(numbers of clients of each category* the midwife hours* the increased ratios)(1+20%)/ the annual work time of each whole-time equivalent midwife.

①Midwife hours: the length of time each woman in each category spent in the delivery suite, from admission in labour to leaving with her baby for postnatal unit or to operating room for emergency CS section.

②Increased ratios: an extra allocation of midwife hours for women in higher need groups (CategoryIII–V)who require care from more than one midwife during labour, or at delivery. These increased ratios of midwife hours are 1.2, 1.3, and 1.4, respectively.

③Annual work time: time spent at work annually of each whole-time equivalent (WTE) midwife (after deducting weekends, public holidays, annual leave, training and sick leave, etc.), which is 250 days, 2000 hours a year.

To estimate the required midwifery workforce, we firstly identified the client category and the midwife hours needed of each client by reviewing the medical records. Secondly, we calculated the time that a midwifery professional could spend at