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Li, Minghui

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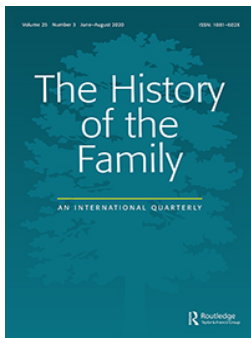
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# Childbirth transformation and new style midwifery in Beijing, 1926 – 1937

Minghui Li

Department of History, University of Groningen, Groningen, the Netherlands

## ABSTRACT


This article offers a comparative analysis of the transformation of midwifery practices in Beijing city and its rural neighborhood in China between 1926 and 1937. From the 1920s onwards, impelled by supports of governments, academic groups and foreign foundations, a reform of midwifery practices was triggered across China. Beijing was one of the forerunners in this reform. Through examining the midwifery regulations, the new style midwifery service, the midwife education/training programs, as well as the consequential influences on birth attendants and birth outcomes (neonatal, infant and maternal mortality rates) in Beijing's first health district and the nearby Qinghe district, this article shows that in the urban district the trained birth attendants performed better than the untrained personnel in preventing neonatal deaths. Also, the growing use of trained midwifery contributed to the reduction of infant and maternal mortality rates in the urban community. However, because of the paucity of sources of rural areas, such positive outcomes cannot be ascertained in the rural district. Yet an obvious urban-rural divergence in midwifery services and maternal care is still observed.

## KEYWORDS

Midwifery; birth attendants; neonatal, infant and maternal mortality; Beijing

## 1. Introduction

In the past century infant and maternal mortality rates have declined substantially all over the world, but the inequality of infant and maternal health in developed and developing countries is still apparent. While infant and maternal deaths have become rare in developed countries since the 1940s, positive results came later in other developing countries. According to the WHO report of 2015, the majority of infant and maternal deaths occur in middle and low-income countries, with rural areas suffering more than their urban counterparts do. To narrow the gap, today recommended solutions underline popularizing skilled birth attendance and appropriate medical interventions in childbirth (World Health Organization, 2015). Indeed, these solutions could be supported by historical experience. Various historical studies have suggested that proper medical interventions and trained assistance in labor were effective in increasing the survival chances of infants and parturient women during the nineteenth and twentieth centuries (Högberg, 2004; Liu, 2004; Løkke, 2018; Ogasawara & Kobayashi, 2015; Shepherd, Schoonheim, Chang, & Kok, 2011; Van Lerberghe & De Brouwere, 2001).

**CONTACT** Minghui Li  [m.li@rug.nl](mailto:m.li@rug.nl)

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For decades, historians have been exploring the role of trained midwifery services in reducing infant and maternal mortality rates. Infant mortality is comprised of neonatal mortality and post-neonatal mortality, the former of which takes place within the first month after birth and is closely connected with endogenous factors such as midwifery skills and the management of complications during pregnancy and childbirth (Loudon, 1991; WHO, 2006). On the basis of previous research and empirical data, Robert Woods (2007) argued that the improvement of the skills of midwives in England from the late eighteenth to the early twentieth century affected the rates of late-fetal and early-neonatal mortality through effectively promoting prenatal supervision and avoiding the risk of infections. Alice Reid (2012) examined the birth results of the increasing supply of trained midwives in Derbyshire between 1917 and 1922, demonstrating that compared with the deliveries attended by doctors and untrained midwives, infants delivered by trained midwives had the least probability of getting infected or dying in the first month of life. Infant mortality, however, is in general impacted by both endogenous and exogenous factors, the latter of which included public sanitation, drinking water, nutrition, and climate (Van Poppel, Jonker, & Mandemakers, 2005; Woods, Watterson, & Woodward, 1989). Despite this, infant mortality rate provides a channel to observe how accessible the skilled medical care is in the first year of infants' lives. Liu (2004) indicated that the implementation of colonial midwifery programs had successfully reduced infant mortality rates in the first half of the twentieth century in Taiwan. Likewise, Ogasawara and Kobayashi's (2015) research on inter-war Japan showed that social workers' efforts in offering medical treatment and childcare guidance to lower-income families mitigated the risks of overall infant deaths.

Maternal mortality is caused by both direct factors such as obstetric complications in pregnancy and childbirth, and indirect factors such as maternal depletion and malnutrition-related diseases which are aggravated by physiologic effects of pregnancy and which are not related to obstetric causes (Janssens & Van Dongen, 2017; Manfredini et al., 2019). In particular, the impact of qualified midwifery services on preventing obstetric complications in history has been well recognized by a large body of literature in the past several decades. Loudon's (1988) comparative study on maternal death in Europe, Australia, New Zealand and the USA asserted that a well-trained birth attendant could efficiently prevent women from the main maternal diseases in childbed. This conclusion is supported by other studies on Western countries, which manifested that before the 1940s the professionalization and training of midwives contributed largely to the decrease of maternal mortality, whereas doctors seemed to produce adverse results as they were more likely to intervene unnecessarily and transmit infections to patients (De Brouwere, 2007; Løkke, 2012; Pantin, 1996).

Nevertheless, the relationship between midwifery services and infant and maternal mortality in developing countries, such as China, in the past is less explored. Since the late nineteenth century, driven by missionary and colonial activities, Western medical science had been widely disseminated across the non-Western world, triggering reforms of midwifery care (Guha, 2018; Hunt, 1999; Johnson, 2011). With regard to China, the art of Western midwifery was first introduced in the mid-nineteenth century, and had gradually gained fame among the Chinese elites before the turn of the twentieth century. Confidence in Western midwifery continued to accumulate, for in many cases the biomedical approaches in labor and relevant medical care proved to be successful in tackling complicated births and diminishing the risks of infant and maternal morbidity (Kerr & Niles, 1888, p. 30; Leutner, 2001, pp. 87–92; Maxwell, 1921, pp. 152–154). In the beginning

of the Republican era (1912–1949), local governments of some areas started to regulate midwives through stipulating midwives' duties and licensing midwives, as what their European counterparts did. From 1928 onwards, in the hope of reducing infant and maternal mortality rates, the Nationalist government officially incorporated the infant and maternal healthcare service into national health initiatives, promulgating ordinances of educating schooled midwives and retraining traditional midwives. In the course of the policy change, the standardized midwifery service developed, including hygienic delivery, prenatal and postnatal care. These measures, concentrating on the knowledge of biomedicine and the practice of antiseptic of the birth attendants, were summarized as the 'new style midwifery', which was distinguished from the traditional midwifery that was grounded on the delivery experience of the female attendants. The formal implementation of the new style midwifery started first in cities and later spread to rural areas in China, yet due to wars and economic upheavals after 1937, the implementation was hampered to varying degrees in different regions. After the Second World War ended in 1945, the new style midwifery was again carried out throughout the country, but the efforts were later taken over by the Communist Party in 1949.

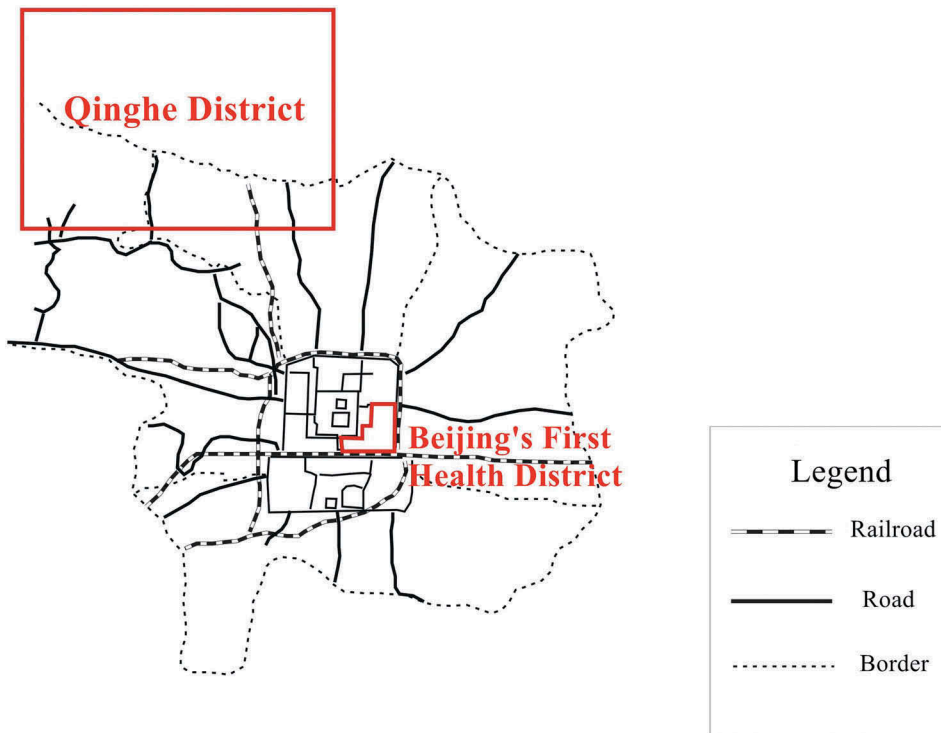
In the historiography of the midwifery reform in the early twentieth-century China, the correlation between childbirth transformation and the shaping of a modern state has been extensively discussed (Chou, 2010; Johnson, 2011; Yao, 2011; Zhang, 2013; Zhao, 2009). These studies have acknowledged the health benefits of the midwifery reform, but are short on analyzing birth outcomes and comparing urban-rural practices. This article attempts to build on the previous literature by examining whether the transformation of midwifery practices influenced infant and maternal mortality and how the reform differed in urban and rural environments, through focusing on an urban district of Beijing<sup>1</sup> and a neighboring rural district. Because of the paucity of sources of the rural district, the quantitative analysis is restricted to the urban district. However, discussions on the urban-rural divide will be presented. Also, due to the limit of reliable quantitative sources, the analysis is confined to a period of twelve years from 1926 to 1937.

To unfold the story, this article will first introduce midwifery regulations and midwife training programs in both the urban and rural settings. Second it will analyze the changing proportions of infants delivered by different attendants over time. Finally it will quantify the neonatal mortality rate (NMR), infant mortality rate (IMR) and maternal mortality rate (MMR), and analyze their potential relationship with the midwifery reform.

## **2. The communities and data**

### **2.1. The urban and rural communities**

The article is based on data of the urban community, the first health district in central Beijing, and the rural community, Qinghe district to the northwest of Beijing (see Figure 1). Located at the southeastern corner to the Forbidden City, the first health district was set as an experimental zone in 1925 under the pilot project to promote public health. This project followed the idea of 'community-based health service' advocated by the medical professor John B. Grant (1890–1962), and was supported by the local government and the Rockefeller Foundation, the latter of which invested in a wide range of health programs in China in the first half of the twentieth century (Bu, 2014, pp. 218–222; Du, 2014, p. 8). In 1928, the district



**Figure 1.** Map of Beijing's first health district and Qinghe district, 1936.

Source: Beipingshi zhengfu mishuchu diyike tongjigu, (1936, p. 18).

was reorganized into a larger one, with the population rising from 50,000 to around 100,000 (He, 1987; Qiu, 1987; Yang, 1999). Owing to its advantageous location in the city, it had been highly urbanized by the twentieth century, attracting numbers of people and materials from surrounding areas and other regions of the country. Western medical institutions, including maternity hospitals, emerged in this district from the late nineteenth century onwards, coexisting with other Chinese pharmacies. After the twentieth century, the diffusion and use of Western medicine in this area proliferated rapidly, and more hospitals and medical colleges were set up.

Qinghe district was the rural region constituted of the central Qinghe town and forty villages circling the town. Instead of being a single administrative unit, this district embodied three administrative territories, part of which overlapped with suburban Beijing. Located 16 kilometers northwest to the first health district, this region was selected for a rural health project conducted by the department of Sociology of Peking University in 1931. In addition to the funding from the university, the project also received donations from local elites (Xu, 1933, p. 4). The majority of the 28,000 inhabitants in this district worked in the agricultural sector, though there was a higher proportion of non-agricultural residents in the town than in the villages (Wang, 1936a, p.348). However, health services were scarce. It was reported that no medical institution existed in the region before 1930. Although there were four private doctors in the town, they were hardly available to villagers nearby (Beipingshi gong'anju diyi weishengqu shiwusuo, 1932, p. 103).

## 2.2. Data

The demographic data are primarily drawn from reports published by the first health station and the municipal health bureau of Beijing, and social surveys conducted by academic professionals. The data were interpreted and presented in tabulated forms in the sources, but the original copies of the birth and death certificates from which these tables derived are not available.

Vital statistics of Beijing's first health district are retrieved from the district health station's<sup>2</sup> annual reports from 1926 to 1937, during which the registration of birth and death was enhanced. These reports encompass information on births as well as infant/maternal mortality, and especially the births and neonatal deaths that in certain years could be linked to the delivery attendants (see [Appendices A and C](#)). Additionally, cause-of-death statistics concerning neonates became available in the reports after 1932, but the causes of maternal death were not systematically specified until 1937. These data enabled the analysis of the interplay between the provision of trained midwifery services and the infant/maternal mortality, and the impact of trained birth attendants on the survival of neonates in the district.

Concerning the quality of the data for the first health district, it is important to discuss the mechanism of vital statistics collection. During the 1920s and 1930s, birth statistics were chiefly obtained from the house-to-house visit by the specialist sanitary inspectors, supplemented by birth notifications from the police and reports by the public health nurses who carried out medical checks at patients' homes.<sup>3</sup> According to the regulation, birth should be reported to the police by the parents or custodians of the child within five days following the delivery (Weishengbu, 1930, pp. 11–12), but this item was not enforced and many births were actually not notified. Being aware of this problem from the beginning, the first health station appointed sanitary inspectors to gather birth statistics through house-to-house visits. Meanwhile, the sanitary inspectors were also sent to hospitals and midwives (both trained and untrained) daily to inquire about birth information. Consequently, the proportion of omitted birth notifications decreased. In fact, the sanitary inspectors were responsible for collecting the majority of birth statistics in the district, and the percentage of births reported by them only declined from 70% to 50% throughout the twelve years. Regarding death registration, it was required that death be reported to the police within three days after the decease (Weishengbu, 1930, p. 11–12). The death report of adults was thought to be reliable, in that only after giving notice to the police was the corpse allowed to be carried out of the city for burial. Whereas, infant deaths were sometimes left out of the report, since infants were so small that it was easy to bury them without drawing others' attention. To resolve this issue, sanitary inspectors were also dispatched to investigate illegal infant burials, which helped complete the overall mortality data (Beipingshi weishengchu diyi weishengqu shiwusuo, 1934, p. 11). However, it was still inevitable that a certain number of infant and maternal deaths were not registered because of the emigration of the families. It was estimated that between 1932 and 1936, nearly 5.5% of the parturient women living in the district moved away not long after their deliveries, making the postnatal follow-up visit impossible (Beipingshi gong'anju diyi weishengqu shiwusuo, 1933, p.61; Beipingshi gong'anju diyi weishengqu shiwusuo, 1935, p.63; Beijingshi weishengju diyi weishengqu shiwusuo, 1938, p. 51).

It has been argued that collecting and reporting reliable data on the numbers and causes of neonatal and maternal mortality had often been doubtful in history and has still

remained problematic in many parts of the world in recent decades, due to various reasons such as the obscurity of disease definition, the changing nosology and dissenting interpretations of the classification of diseases (Frazier, Nesbitt, & Pentecost, 1957; Kippen, 2005; Lawn, Osrin, Adler, & Cousens, 2008; Reid & Garrett, 2018). Thus, how the causes of death were assigned should be considered. Before the establishment of the first health district, causes of death were usually registered by police officers as given by relatives or Yin-Yang-Sen, a man who was deemed to be the expert of confirming the end of one's life and of arranging funeral rituals (Yang, 1999), and were therefore often meaningless from a medical perspective. In 1926, the recording of causes of death in the district was consigned to a trained medical statistician, who, by questioning family members and by viewing the corpse, determined the cause in accordance with the *International List of Causes of Death*.<sup>4</sup> The first year's work provided experience to the leading health workers of the district, who soon proposed the *Tentative Classification of Causes of Death* after reconciling the *International List* with local lay vocabulary in assigning the causes. The tentative list was believed to be suitable for public health work citywide in Beijing, and was planned to be used nationwide later.<sup>5</sup> In particular, according to the tentative list, causes of maternal death were all termed as 'Puerperal Condition', which included puerperal problems and diseases during the pregnancy, labor, and postpartum period, as were stated in the *International List* (Grant, Huang, & Hsu, 1927, p.18; Health Organization of the League of Nations, 1927, p. 892). In 1928, the investigation of death in the first health district was handed over to several sanitary inspectors, who were trained to identify the causes of death under the supervision of the physician in charge of the vital statistics of the station.<sup>6</sup> It was believed that by 1930, the sanitary inspectors had made significant progress and become proficient in death investigation (Beipingshi gong'anju diyi weishengqu shiwusuo, 1931, p. 11). Though it is possible that the causes of some infant and maternal deaths were misreported, it can be inferred that the sanitary inspectors had become progressively capable of identifying the causes of death as they gained more experience.

In spite of the inherent problem of under-registered births and deaths, the quality of vital statistics improved over time. As the working relationship between the health station and the police was meliorated, and as both the sanitary inspectors and urban residents became increasingly familiar with the vital statistics work in the community, information on births and deaths was collected more efficiently (Beipingshi gong'anju diyi weishengqu shiwusuo, 1932, p.19; Bu, 2017, p. 126). Thus, it is reasonable to say that statistics of mortality and causes of death became rather reliable especially after 1930. In fact, data of Beijing's first health district are considered high in quality compared with contemporary records of other areas in China (Hou, 2001, p. 399).

Although the public health work in Qinghe district was in cooperation with the first health station and shared similar routines with its urban counterpart, the collection of vital statistics in this rural region was hardly conducted. Useful data for this article concern the infant mortality of Qinghe town from 1931 to 1933, which are obtained from demographic surveys. The staff of the rural health station believed that the infant mortality data were rather accurate, as it was manageable to trace births and deaths among 3100 town dwellers (Li, 1935, p. 23). Though scarce, the IMR data could to some extent represent the state of infant health in the rural areas near urban Beijing, and could be used for comparison with data of the first health district.



From 1934, reports of all urban and suburban districts of Beijing were submitted to the municipal health bureau annually, and accordingly health yearbooks of the city were produced. They recorded statistics about population, birth and mortality, and the percentage of the participation of different attendants in deliveries. Unfortunately, only the reports of 1934 and 1938 have been found, with the data less accurate than those of the urban and rural districts under discussion. However, these data could still exhibit the probable state of infant and maternal health of the city, and could be referred to when comparing the urban and rural districts.

### 3. New style midwifery in Beijing

#### 3.1. Midwifery regulation

Prior to 1900, though missionary doctors had begun applying Western obstetrics when attending Chinese women in childbirth, Western midwifery was essentially a privilege for a limited amount of people in treaty ports and big cities. The majority of women in China either were assisted by traditional midwives, female relatives and neighbors in their communities, or gave birth on their own. Entering the twentieth century, as Western medicine became more available and widely-known than before, an increasing number of young intellectuals chose to study medical science at home and abroad, enlarging the body of Chinese intellectuals who practiced Western medicine. At the same time, medical professionals developed a preference for Western midwifery, believing that the biomedical and hygienic methods would enable birth attendants to better manage the biological procedures of childbirth and would lower the chance of perinatal infections (Leutner, 2001).

After 1928, backed by medical professionals, the Nationalist government officially proposed to standardize midwifery services into three parts, namely, hygienic delivery, prenatal and postnatal care. These measures were thought to be helpful in discovering potential risks during pregnancy, and preventing premature birth, tetanus neonatorum, puerperal fever, toxæmia and haemorrhage (Shen, 1949; Wang, 1936b; Yang, 1939), which were then the main killers of mothers and newborns in both China and other countries (Loudon, 1988; Beipingshi weishengju diyi weishengqu shiwusuo, 1936, p.18; Nongcun fuxing weiyuanhui, 1934, p.296). The standardized midwifery was named 'new style midwifery', and was integrated into the national initiatives of promoting infant and maternal health. Actually, the government's active interventions fit in the international trend from the 1920s to the 1940s that nations took the responsibility for improving public health (Bu, 2014, p. 227).

Training and regulating midwives started as early as the eighteenth century in some European countries, and became worldwide after the late-nineteenth century (De Brouwere, 2007; Loudon, 1992). In China, the licensing system of midwives was not established until 1906, when the Qing Empire was on the edge of its collapse (Zhang, 2013, p. 126). After that, other legislations were released either by national or local authorities, exerting more explicit controls over midwives' skills and performances.

In Beijing, the regulation of midwives could be separated into two phases. In the first quarter of the twentieth century, traditional midwives, together with physicians who attended childbirth as well, were required to get licensed at the municipal police office. The duties of midwives were precisely defined. For instance, killing infants was seen as

a criminal offence, and it became compulsory for a midwife to refer the parturient woman to a doctor once complications occurred (Jingshi jingchating, 1999, pp. 69-70). In the meantime, the group of young and educated midwives, who received degrees from professional schools or medical institutions, had been enlarging in the first three decades of the twentieth century. As the educated midwives' role in the midwifery market increased, they were officially termed as "new style midwives" and were also put under regulation after the late 1920s. In 1928, two updated legislations were released by the Ministry of the Interior. Regarding the traditional midwives, in addition to the defined duties, they were demanded to take two-month training courses on childbirth hygiene and maternal care before getting licensed and practicing midwifery (Neizhengbu, 1936, pp. 311-312). Nevertheless, in reality the midwives who failed the training were still permitted to attend deliveries, but they were, like their trained colleagues, placed under the supervision of physicians and new style midwives of the health stations. As for the new style midwives, they could only receive certificates after obtaining degrees from identified midwifery schools or medical institutions at home or abroad. During the childbirth, they were not allowed to perform surgery, and were required to send the parturient women to physicians or hospitals if complications took place. (Neizhengbu, 1934, pp. 53-54).

### ***3.2. Midwifery service in the urban and rural communities***

After the first health district was established as an experimental zone in 1925, the district's health station made efforts to ensure that the standardized midwifery services were accessible to women in the community. To encourage prenatal care, the health station not only propagandized having health examinations in the station or other hospitals before labor, but sent staff to offer care at homes. In 1934, the health station put forward a new rule that only women who took prenatal examinations could be assisted in the labor by physicians or new style midwives from the station, which to some extent promoted the rate of prenatal care in the community (Beipingshi weishengju, 1935, p. 40). On the day of delivery, usually a midwife, whether a traditional or a new style one, would be called to home. The trained midwives (new style midwives and trained traditional midwives) were requested to carry a kit with a range of pharmaceuticals, bandages and instruments, which were used in the hygiene and sterilization procedures (Beipingshi weishengju di'er weishengqu shiwusuo, 1935, pp.106-108). If complications occurred, the midwife should call a physician or transfer the woman to a hospital, depending on how imperative the situation was. If the delivery was successful, the mother would be encouraged to attend postnatal examinations either in a hospital or in the health station within six weeks after the delivery. In some cases, the health station also rendered postnatal care at the patients' homes (Beipingshi weishengju, 1935, pp. 272-275). During the postnatal care, midwives or nurses paid special attention to the health of mothers and newborns, instructing the mothers on individual hygiene, breast-feeding, infant bathing, navel care and diaper changing to prevent postnatal problems (Beijingshi weishengju diyi weishengqu shiwusuo, 1938, p. 52).

In 1931 a health station was set up in the rural Qinghe town, and in the next year it began to offer new style midwifery care. Although initially only one new style midwife worked in the town station, she took the lead in popularizing infant and maternal care

among rural women and native midwives, through visiting local families and giving short lectures in public (Nongcun fuxing weiyuanhui, 1934, p. 296). Due to the lack of assistants, home care turned out to be infeasible, so prenatal and postnatal care was only provided in the health station in the town. However, pregnant women from the villages were reluctant to go to the town due to the poor road conditions and their sense of shame of exposing themselves in public places during pregnancy (Wang, 1936a, p.360; Zhu, 1934, pp.317–324). Despite this, women in this district gradually invited midwives of the station for home delivery. If it happened to be a complicated case, midwives would call a physician from the town, or send the woman to a hospital in Beijing city.

Moreover, both health stations of the above-mentioned urban and rural districts provided subsidies to poor families in the communities, trying to make the new style midwifery accessible to as many women as possible.

### **3.3. Education of new style midwives**

The education of midwives in China started from training programs of missionary hospitals in the late nineteenth century. A few midwifery training programs and schools were launched at the end of the nineteenth century, but it was only after the 1920s that the number of midwifery schools increased rapidly across the country. The development of midwifery schools was accompanied by the impressive growth of the number of new style midwives. While in 1908 there were only nine midwives who had degrees from formal midwifery programs/schools, 1234 educated new style midwives had been certified by 1932 (Neizhengbu, 1933, p. 15). The number further climbed to 3694 in 1938 (Neizhengbu, 1938, p. 41), indicating a fruitful development of midwifery education.

By 1932 there were in total nine medical institutions in Beijing that offered midwifery education to young women (Neizhengbu, 1933, p. 15). Among these institutions, the First National Midwifery School was the most famous one. Though how other institutions organized their midwifery education is rarely known, the reports of the First National Midwifery School offer some clues. Founded in 1929, this school had designed four programs to meet the demands of students with different backgrounds of knowledge and experience. The most important training track provided two-year courses to female students who at least had finished secondary education. Students should take advanced courses such as Anatomical Physiology, Pharmacology, Gynecology and infant nursing. After finishing theoretical courses, students were sent to different maternal institutions for internship (Diyi zhuchan xuexiao, 1931a, p. 7). The home addresses of the students on the annual records show that most students came from cities, while only a small number of them originated from rural areas. Owing to this contrast, it makes sense that most graduates chose to serve in urban areas after completing their education (Diyi zhuchan xuexiao, 1931b, p. 12, p. 24).

Compared with urban Beijing, midwifery education in Qinghe started later and maintained a lower standard. Soon after 1932, the rural health station launched a plan of educating local new style midwives. Nonetheless, as female education in rural areas was limited, rural women hardly had sufficient knowledge for an advanced midwifery study. Eventually, only one girl with a primary school degree was qualified for the education plan. The only admitted female student did manage the professional study and became an independent trained midwife one year later (Cui, 1935, pp. 61–62). Obviously, the educated midwives were far from enough.

In 1935, a new six-month project commenced to train more maternal assistants. From local villages the health station picked ten women aged from twenty to thirty, each of whom was expected to serve four to six villages near her home. Considering the restricted literacy of these women, the first three months were spent teaching them simple reading and math, and the latter three months were used for specialized midwifery courses. On finishing the theoretical study, all students were required to deliver babies independently five times under the surveillance of staff of the health station. It is not known how qualified these maternal assistants were, but the staff of the station seemed to be satisfied with the assistants after the project ended (Wang, 1936a, p.360).

### **3.4. Retraining of traditional midwives**

Immediately following the midwife legislations in 1928, a specialized institution was founded in Beijing in charge of retraining traditional midwives. From 1928 to 1930, 252 traditional midwives had taken part in the training courses in Beijing, yet only 152 of them passed the exams and received certificates. In 1930, the institution was renamed as 'Infant Health Station'. Training courses included concise introduction on Anatomy, methods of sterilization before and during delivery, methods of clamping and cutting umbilical cords, methods of resuscitating the newborn of asphyxia, and methods of treating puerperal fever (Diyi zhuchan xuexiao, 1932, p. 96). Whether successfully trained or not, all traditional midwives were under the surveillance of physicians and new style midwives of the health stations of their districts (Diyi zhuchan xuexiao, 1931b, p. 158). Specifically, staff of the health stations routinely required the midwives to orally report how they processed deliveries in their attendance, and gave relevant instructions and advice correspondingly (Beipingshi weishengju di'er weishengqu shiwusuo, 1935, p. 19, p. 69). If a trained traditional midwife was found to violate rules of hygiene, her certificate might be revoked. Even though traditional midwives did not perform prenatal or postnatal care, they helped advertise it by disseminating related information in the neighborhoods. In particular, the trained traditional midwives were required to inform their clients about the advantages of prenatal and postnatal care, and to persuade women to go to the health stations for special examinations (Beipingshi weishengju di'er weishengqu shiwusuo, 1935, p. 67).

Retraining traditional midwives in rural areas encountered more barriers. Given that medical facilities and health personnel were lacking, the training program in Qinghe was compressed into two weeks, with the midwifery knowledge explained in brief and simple ways. In the beginning, traditional midwives were gathered into the training classes under the demand of local officials, but later it was through the health staff's active interactions with the midwives that the training classes kept on running (Zhu, 1934, p. 319). However, the training results appeared to be unsatisfactory. According to the staff of Qinghe's health station, though all the fifty midwives in the villages had attended training courses by 1934, many of them continued to perform in their old ways (Wang, 1936a).

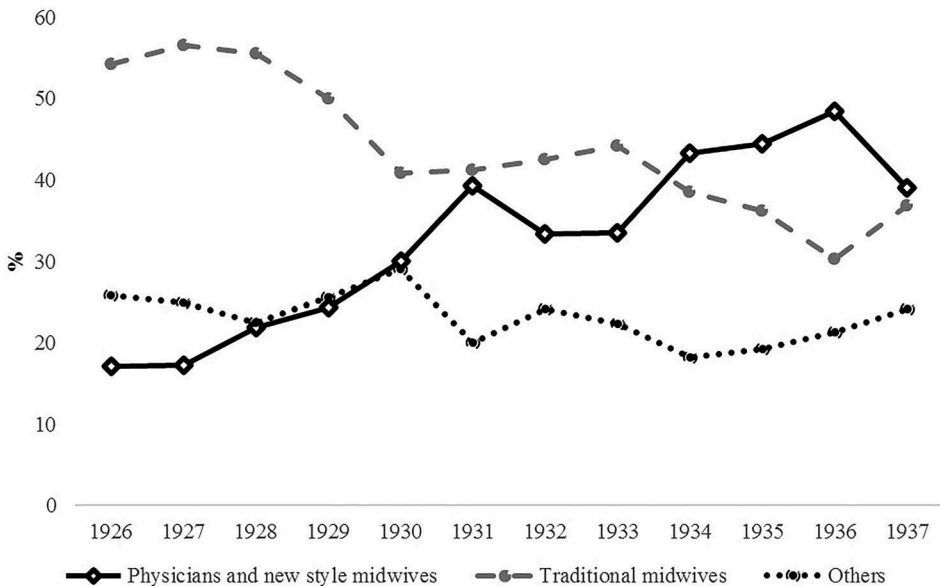
The reskilling of traditional midwives was interrupted in 1937 in both Beijing and Qinghe when the Second Sino-Japanese (1937–1945) war broke out. The Infant Health Station was shut down, and the health staff of Qinghe either returned to Beijing or moved elsewhere.

#### 4. Changing pattern of birth assistance

What were the outcomes of implementing new style midwifery during the 1920s and 1930s in Beijing's first health district and Qinghe district? Did the participation of different birth attendants change over time? Due to the dearth of sources of Qinghe, the following analysis will concentrate on the first health district, but a concise discussion on the urban and rural communities will be given afterwards.

Birth attendants recorded in the health reports of Beijing were generally categorized into three groups, namely, physicians and new style midwives, traditional midwives, and others. Physicians and new style midwives were certainly different from each other in terms of both the delivery duties and the ability to manage childbirth-related problems, yet they were placed in the same category in the health reports. This might be because that the health stations considered both physicians and new style midwives as educated personnel with sufficient knowledge of hygiene and medical science, which distinguished them from other uneducated attendants. From 1932, the group of traditional midwives was further classified into trained and untrained ones in the reports of the first health district, and such classification was also applied to the reports of other districts of Beijing by the mid-1930s. As for others, they referred to female relatives/neighbors and the parturient women themselves, who did not have any professional training. Nevertheless, the sources did not indicate the economic and social backgrounds of the mothers delivered by different attendants.

As [Figure 2](#) shows, the change of the proportions of infants delivered by different attendants was remarkable between 1926 and 1937 in the first health district. In the span of twelve years, the percentage of traditional midwives' participation fell from 55% to around 35%, whereas that of physicians and new style midwives increased nearly twofold,



**Figure 2.** Percentage of infants delivered by different birth attendants in Beijing's first health district, 1926–1937.

Source: [Appendix C](#).

from below 20% to around 40%. The changing pattern indicates that the midwifery regulations, the expanding supply of physicians and new style midwives, and the promotion of infant and maternal care guided people's options for professional midwifery services. Meanwhile, it suggests that the acceptance of new style midwifery in the community was rising, which could be attributed not only to the improving quality of midwifery services, but also to the favorable financial supports that enabled poor families to have qualified services at a low price.

However, it is not clear why the percentage of 'others' did not change much. One possible explanation concerns the cost. It is not known how much the untrained attendants charged for a delivery, but it is presumed that new style and trained traditional midwives asked higher fees than the untrained midwives and other female relatives/neighbors, as the former ones used specific pharmaceuticals and instruments that would cost more. Moreover, the non-midwife female attendants might charge even less as they did not consider delivering babies to be the source of income in the first place. Hence, it is plausible that the lower cost of asking a lay woman was attractive enough to maintain a certain proportion of births, especially natural births without any complication, delivered by others. Another possible reason is that in this community a group of women might have certain social network on which they could rely in delivery, therefore they did not have to invite people they were unfamiliar with. Similar decisions of choosing birth attendants in close proximity could be found in history elsewhere where a dramatic replacement of uncertified birth attendants was taking place (Curtis, 2005; Wu, 2010).

It is noteworthy that the percentages of infants delivered by both traditional midwives and others climbed again in 1937, while that by physicians and new style midwives decreased. This was mainly because as the Second Sino-Japanese war broke out in the summer in this year, physicians and new style midwives of the health station had to decline nocturnal delivery calls in case of danger or attacks (Beijingshi weishengju diyi weishengqu shiwusuo, 1938, p. 51).

Table 1 demonstrates the percentage of infants delivered by different birth attendants in Beijing's first health district (1932–1937) and the whole Beijing city (1934). Note that the statistics for Beijing included both urban and suburban districts, the latter of which shared common characteristics with the surrounding rural regions. Apparently, the first health district was a forerunner of practicing new style midwifery in the city. From 1932 to 1937, in the first health district the average percentage of infants delivered by trained attendants, which included physicians, new style midwives and trained traditional midwives, amounted to more than two thirds of the total. Meanwhile, deliveries by the untrained traditional midwives occupied less than 8% and that by others constituted one fifth. In

**Table 1.** Percentage of infants delivered by different birth attendants in Beijing's first health district (1932–1937) and Beijing's all districts (1934).

	Physicians and new style midwives	Traditional midwives (trained)	Traditional midwives (untrained)	Others	Unknown	Total number of births
Beijing's first health district (1932–1937)	40.5%	30.2%	7.8%	21.5%	0	16,737
Beijing's all districts (1934)	11.2%	25.7%	3.5%	52.0%	7.6%	22,184

Source: Statistics of the first health district are calculated based on Appendix C; statistics of Beijing come from Beipingshi weishengju [Beiping metropolitan health bureau] (1935, p.9, table 9).

contrast, figures for Beijing of 1934 show that in the whole city the untrained attendants delivered more than half of the infants, while around 37% of births were attended by the trained. Particularly, physicians and new style midwives delivered 11.2% of all births, and the trained traditional midwives were responsible for a quarter of all births, both playing a weaker role than those in the first health district. Thus, it could be reasoned that in the suburban districts of Beijing and other rural neighborhoods, the use of new style midwifery was obviously lagged behind.

This contrast surely points to the unequal distribution of medical resources and financial investments in different districts, but also hints that women in rural areas were less willing to have assistance from outside their network. Indeed, rural women tended to be delivered by relatives/neighbors or by themselves to save money, and regard child-birth as a natural event that physicians and midwives were only needed when emergency occurred (Pan, 1932, pp.282–283; Yang, 1936, p. 14). These might explain why in the course of the midwifery reform a certain proportion of infants were still attended by untrained helpers.

## 5. Birth outcomes

### 5.1. Neonatal mortality rate (NMR)

Table 2 below shows the NMR of infants delivered by different birth attendants in the first health district in 1932, 1933, 1934, 1935 and 1937.<sup>7</sup> According to the average rates of each type based on the five-year records, it seems that physicians and new style midwives had a slightly better outcome than the trained traditional midwives, followed by others, while the untrained traditional midwives scored the worst. However, it is unusual that in 1937 the record of neonatal deaths in association with ‘others’ was completely absent, while the NMR of infants delivered by untrained traditional midwives was surprisingly much higher than the rates of previous years. The report of 1937 did not explain the disappearance of ‘others’ in the table, but in its following analysis still attributed the majority of neonatal deaths from convulsions and tetanus to the mishandling by both untrained midwives and other lay helpers (Beijingshi weishengju diyi weishengqu shiwu-suo, 1938, pp. 16–17). Thus, it can be inferred that errors were made when tabulating the mortality figures, and some of the 66 neonatal deaths associated with untrained traditional midwives were actually related with ‘others’.

For this reason, in Table 3 the birth attendants are reclassified into two groups, namely, trained attendants (physicians, new style midwives and trained traditional midwives) and untrained attendants (untrained traditional midwives and others), and it seems that the trained attendants performed significantly better than the untrained.<sup>8</sup> In this regard, compared with attendants without any professional training, the trained attendants in general were more capable of saving neonates from risks of deaths.

An examination of the causes of death might help explain the distinctions in the capabilities of the four types of attendants. Table 4 shows the NMR and related causes in the first health district, categorized by birth attendants. The rates displayed in each column are calculated based on the total number of births and neonatal deaths connected with the four types of attendants respectively, from 1932 to 1935 when specified causes were available. It is evident that the primary causes of neonatal deaths, regardless

**Table 2. Neonatal mortality rate and birth attendants in Beijing's first health district, 1932, 1933, 1934, 1935 and 1937 (categorized in four groups).**

Year	Physicians and new style midwives			Traditional midwives (trained)			Traditional midwives (untrained)			Others		
	Number of births	Number of neonatal mortality	NMR % <sub>100</sub>	Number of births	Number of neonatal mortality	NMR % <sub>100</sub>	Number of births	Number of neonatal mortality	NMR % <sub>100</sub>	Number of births	Number of neonatal mortality	NMR % <sub>100</sub>
1932	833	33	39.6	708	38	53.7	352	33	93.8	601	46	76.5
1933	934	24	25.7	1,042	49	47.0	190	10	52.6	621	34	54.8
1934	1,228	76	61.9	947	28	29.6	145	20	137.9	516	14	27.1
1935	1,288	50	38.8	896	36	40.2	154	5	32.5	562	37	65.8
1937	1,101	43	39.1	748	37	49.5	288	66	229.0	682	unknown	unknown
Average			42.0			43.3			118.7			57.0

1. Source: Beipingshi gong'anju diyi weishengqu shiwusuo (1933); Beipingshi weishengchu diyi weishengqu shiwusuo (1934); Beipingshi weishengju diyi weishengqu shiwusuo (1935, 1936); Beipingshi weishengju diyi weishengqu shiwusuo (1938).

2. The data of neonatal mortality for 1936 are missing, and therefore the year 1936 is excluded in the table.

3. Information of neonatal mortality in the column of 'others' for 1937 is absent.



**Table 3.** Neonatal mortality rate and birth attendants in Beijing's first health district, 1932, 1933, 1934, 1935 and 1937 (categorized in two groups).

Year	Trained attendants			Untrained attendants		
	Number of births	Number of neonatal mortality	NMR ‰	Number of births	Number of neonatal mortality	NMR ‰
1932	1,541	71	46.1	953	79	82.9
1933	1,976	73	36.9	811	44	54.3
1934	2,175	104	47.8	661	34	51.4
1935	2,184	86	39.4	716	42	58.7
1937	1,849	80	43.3	970	66	68.0
Average			42.6			64.5

Source: Adjusted from Table 2.

**Table 4.** Neonatal mortality rate and birth attendants in Beijing's first health district (categorized by the causes of death), 1932–1935.

Causes of death	Physicians and new style midwives		Traditional midwives (trained)		Traditional midwives (untrained)		Others	
	Number of deaths	NMR ‰	Number of deaths	NMR ‰	Number of deaths	NMR ‰	Number of deaths	NMR ‰
Prematurity and debility	129	30.1	94	26.1	27	32.1	77	33.5
Neonatal convulsions and tetanus	26	6.1	37	10.3	35	41.6	41	17.8
Respiratory diseases	13	3.0	11	3.1	4	4.8	10	4.4
Other infectious diseases	4	0.9	3	0.8	0	0	1	0.4
Diarrhea	3	0.7	4	1.1	2	2.4	1	0.4
Other causes	8	1.9	2	0.6	0	0	1	0.4
Total number of births	4,283		3,593		841		2,300	

Source: Beipingshi gong'anju diyi weishengqu shiwusuo, (1933); Beipingshi weishengchu diyi weishengqu shiwusuo, (1934); Beipingshi weishengju diyi weishengqu shiwusuo (1935, 1936).

of whoever took charge of the delivery, were prematurity and debility. Prematurity and debility are interlinked and are influenced by a variety of forces, such as the economic status of the family, the location of residence, mother's health and lifestyle, genetic factors, and the provision of prenatal care (Dragonas & Christodoulou, 1998, p. 128; Savitz & Pastore, 1999, pp. 63–64). In the case of the first health district, there was no difference in the chances of neonates surviving prematurity or debility after being delivered by any of the four types of attendants. This suggests that, in addition to other socioeconomic variables, the prenatal care and early medical assistance rendered to most of the pregnant women were inadequate in this period.

Convulsions and tetanus were the second most fatal causes of neonatal death in the district. While tetanus of neonates predominantly results from exposure to infections that are associated with unhygienic methods of delivery and poor umbilical-cord care (Roper, Vandelaer, & Gasse, 2007), neonatal convulsions are affected by a wider range of factors, including medical complications before and during labor, congenital cerebral malformations, and metabolic disorders (Pressler, 2015; WHO, 2011, p. 9). It is not known to what extent the midwifery-related factors caused neonatal convulsions, but the reports of the first health district emphasized that the untrained midwives' ignorance of hygiene should be blamed for the higher rates of neonates dying from convulsions (Beipingshi weishengju, 1935, p. 17). The figures, overall, give a general insight to how birth hygiene and infections were managed by different attendants.

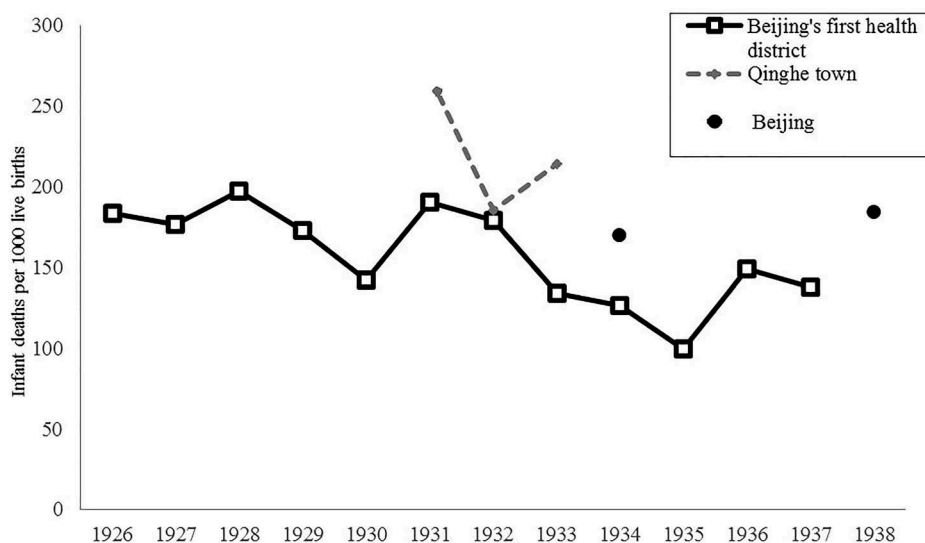
Apparently, physicians and new style midwives achieved the best outcomes in preventing neonatal convulsions and tetanus, but the results of the trained traditional midwives were also positive. Compared with infants delivered by the trained traditional midwives, the risk of neonates dying from convulsions or tetanus was 8‰ higher if they were delivered by others, and 30‰ higher if they were delivered by untrained traditional midwives. Experience in Western countries showed that before the 1940s doctors were more likely to cause infection-related death in labor than the trained midwives (Loudon, 1988), but it is difficult to deduce whether this was also the case in Beijing from the relatively low death rate of convulsions and tetanus associated with ‘physicians and new style midwives’. Since vital statistics of births attended by physicians and new style midwives in the first health district were not separated, it is possible that problems brought about by physicians were offset by the good performance of new style midwives. Also, though the number of institutional births was ascending, the majority of births in this period took place at home, which restricted the chance of physicians carrying infections between maternal wards. Overall, records of the reports left the impression that childbirth hygiene had already become common sense among most of the educated medical staff during the 1920s and 1930s, and thus physicians and trained midwives should be well aware of the importance of antisepsis.

The reason why the NMR of infants delivered by others was lower than those by untrained midwives is unclear. It is probable that women seeking no help from midwives or physicians were in better health, which promoted the survival chance of the newborns. However, it is also possible that deaths of infants delivered by others were more likely to be under-reported as it was harder to trace delivery activities of the lay women helpers.

The investigation of the causes of neonatal death reveals that the distinction of the attendants lies in their capabilities of preventing infections in childbed. Particularly, while physicians, new style midwives and trained traditional midwives could well manage infections, untrained midwives and the others were less conscious of keeping the delivery procedures clean. More notably, the results imply that once a traditional midwife was equipped with basic knowledge and skills of hygiene and obstetrics, her performance improved tremendously. Therefore, it is reasonable to say that trained attendants had better birth outcomes than the untrained ones because they could effectively use hygienic methods in labor.

## **5.2. Infant mortality rate (IMR)**

Figure 3 shows a declining trend of IMR in Beijing’s first health district from 1926 to 1937. The IMR dropped to a lower point in 1930, but in 1931 rose again to the previous level. The rise was partly due to the more complete information resulting from the improvement of vital statistics, and partly due to a widespread epidemic in the region this year. (Beipingshi gong’anju diyi weishengqu shiwusuo, 1932, p. 13, p.19). The IMR went steadily downwards from 1931 to 1935, but climbed upwards again in 1936. Generally speaking, the falling trend of the IMR seemed to be correlated with the growing trend of trained birth attendance. Aside from the increasing use of hygienic methods in labor, the health staff also rendered infant care, medical assistance and instructions on motherhood in the postnatal period, which to some extent helped enhance the survival chance of infants in the first year of their lives. Nevertheless, it cannot be denied that the progress of public health, such as the



**Figure 3.** IMR of Beijing's first health district, Qinghe town and Beijing (all districts), 1926–1938.

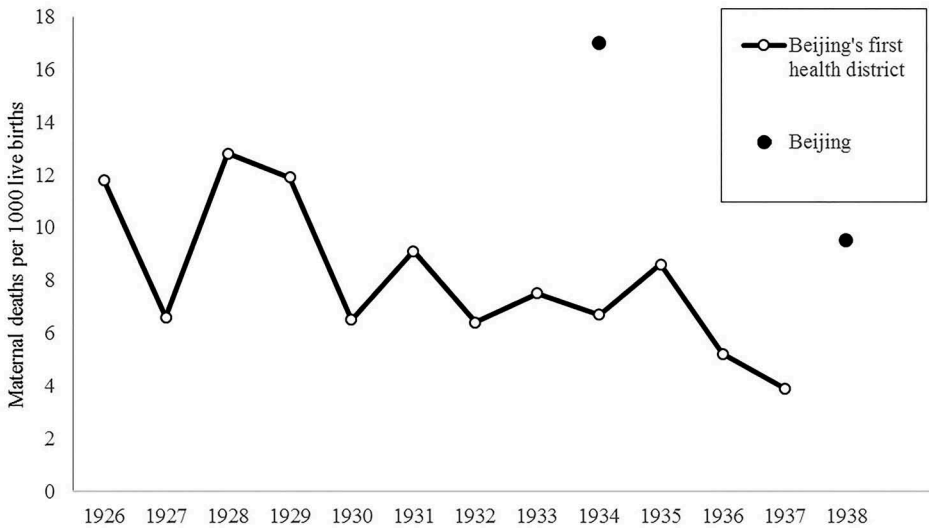
Source: [Appendices A and B](#).

improvement in vaccination, drinking water and sanitary conditions in the urban district played an important role as well. (Beipingshi weishengju, 1935, p. 128).

The IMR of Qinghe town varied from 185‰ to 258‰ from 1931 to 1933. In addition to the epidemic that struck the region in 1931 and the evidently worse sanitary environment in rural areas (Nongcun fuxing weiyuanhui, 1934, p. 295), the high level of infant mortality in the town was also due to the fact that from 1931 to 1933 the midwifery reform was still in its infancy, and had little progress: facilities and personnel for infant and maternal healthcare in this district were much less available than in the city, and rural women were less convinced by the new methods of childbearing. With little information it is impossible to predict either the IMR of other villages near the town, or how the IMR of Qinghe town developed after 1933. However, it is certain that there was an urban-rural divergence in infant health in this region. The IMRs of the whole Beijing of 1934 and 1938 were 170‰ and 184‰ respectively. Considering the fact that medical and sanitary facilities in rural areas were inferior to those in urban areas, it is highly likely that the IMR of Qinghe district maintained higher than the average level of Beijing from the mid to late-1930s.

### 5.3. Maternal mortality rate (MMR)

Figure 4 shows that the MMR of the first health district, though fluctuating, fell from 12‰ in 1926 to 4‰ in 1937. By and large, this decline went hand in hand with the growing proportion of infants delivered by physicians, new style midwives and trained traditional midwives, as can be seen in [Appendix C](#). However, the rather low point of MMR in 1937 seems to be incompatible with the decreased percentage of births attended by trained personnel in this particular year. Such an inconsistency might be explained by the fact that as numbers of families fled the city after the war broke out, the follow-up tracking of maternal mortality was interrupted to a larger extent. It was estimated that from 1932 to



**Figure 4.** MMR of Beijing's first health district and Beijing (all districts), 1926–1938.

Source: [Appendices A](#) and [B](#).

1936, 5.5% of women moved away from the district annually not long after their deliveries, but in 1937 this percentage rose to 12% (Beijingshi weishengju diyi weishengqu shiwusuo, 1938, p. 51). It is possible that the percentage of parturient women who fled during the war was still underestimated, but it might not be too far from reality since both the local activities and public health work gradually restored to order three months after the outbreak of the war (Beijingshi weishengju diyi weishengqu shiwusuo, 1938, p. 7). Furthermore, even when taking into account the emigrant mothers, the MMR would still remain relatively low, though slightly higher than the figure in the report.

It has been widely recognized that the use of sulphonamides after 1935 in some Western countries contributed immensely to the reduction of puerperal sepsis and subsequently to the drop in maternal mortality figures (Loudon, 1992, pp. 258–261). However, there is no evidence of the clinical use or mass production of sulpha drugs in Beijing before 1939. In this regard, the decrease of the MMR should mainly be attributed to the growing participation of skillful birth attendants who paid much attention to childbirth hygiene. As the qualified midwifery care became accessible to a broader female population, and as the obstetric skills of trained personnel progressed year after year, a larger proportion of women were protected against contracting infections in labor than ever before. Moreover, when complications or accidents occurred, medical aids would be applied by calling a physician or sending the parturient woman to a hospital, which were believed to relieve emergencies effectively. This is also in line with the experience of Western countries during the nineteenth and twentieth centuries when the mounting access to skilled midwifery services and the trained midwives' referring women to hospitals benefited the reduction of maternal mortality (Bergström & Goodburn, 2001; Kotsadam, Lind, & Modalsli, 2018).

Maternal mortality in Qinghe district is rarely known, but the data of Beijing as a whole provide some clues about the MMR level in suburban areas. In 1934, the MMR of Beijing

was 17‰, 2.5 times as high as that of the first health district. In 1938, it was 9.5‰, 2.5 times as high as that of the first health district in 1937. It is hard to evaluate whether maternal mortality of Beijing continuously mitigated from 1934 to 1938 with data of only two years, yet these figures indicate that maternal mortality was more severe and midwifery services were less developed in the peripheral districts than in the urban districts. This contrast again confirms the urban-rural gap in the childbirth transformation.

## 6. Conclusion

This article has investigated the transformation of childbirth practices and the subsequent outcomes in Beijing from 1926 to 1937. It unveils the positive effects of the growing provision of qualified midwifery services on the infant and maternal mortality, and reveals the urban-rural divide in maternal care, which was also influenced by socioeconomic variables.

In the period under discussion, both the IMR and MMR of Beijing's first health district show declining trends, which were due to various initiatives concerning midwifery training and infant and maternal healthcare. It is risky to draw a conclusion from a dataset covering a period of only twelve years, but it could be safely inferred that the dramatic changes of midwifery practices could take effect in an era when antisepsis and asepsis were routinely practiced and when there were favorable political and financial motivations. Indeed, the local government made great efforts to lower infant and maternal mortality rates by strengthening its control of both midwifery services and birth attendants. At the same time, a range of regulations were scheduled, educational and training programs were intensified, and propaganda was launched. These measures imparted the knowledge of biomedicine and hygiene to the public, transformed the practices of infant and maternal care before, during and after labor, and expanded the supply of qualified birth attendants in the market, leading to the rising use of the new style midwifery. Though the midwifery skills varied individually, the rising accessibility of trained and skilled midwifery services contributed to the reduction of IMR and MMR on the whole. Nonetheless, despite the progress, the IMR and MMR of Beijing in the 1930s in general were clearly higher than many Western European countries in the same period, whose IMR ranged from 50 to 100 per 1000 births and MMR from 2.5 to 5 per 1000 births (Loudon, 1992, p. 497).

Trained midwifery played an important role in delivering positive birth outcomes, especially in protecting neonatal health. From the perspective of the causes of death, the trained attendants achieved better results than the untrained ones in preventing deaths caused by neonatal convulsions and tetanus, though both had difficulties in treating preterm births and debility. This means that the trained were more capable of using hygienic methods and preventing infections than the untrained ones. More noticeably, the skills of the trained traditional midwives were greatly distinguished from the untrained traditional ones, as infants delivered by the former midwives had one-fourth of chances of dying from neonatal convulsions and tetanus compared with those delivered by the latter. This agrees with Robert Woods's (2007) research that skilled and trained midwifery care was beneficial to protecting late-fetal and early neonatal health.

Nevertheless, the urban-rural discrepancy was marked in terms of the midwifery service and infant and maternal healthcare. In the absence of quantitative data, it is difficult to compare the demographic effects in Qinghe with Beijing's first health district. However, from the limited IMR data of Qinghe town, as well as the IMR and MMR of the

whole Beijing city, it could be concluded that there was a gap in the overall infant and maternal health in urban and rural areas. Such a gap arose from variations of economic development, educational levels, medical resources, financial supports and cultural norms in city and villages, as discussed above. In fact, it was more difficult to educate new style midwives, to retrain the traditional midwives, and to convince women of using new style midwifery in rural areas than in the city.

In summary, the case of Beijing sheds light on how the Western form of regulating midwifery services and birth attendants was implemented in and adapted to the Chinese society in the first half of the twentieth century, and how it influenced birth attendance, as well as neonatal, infant and maternal health at the local level. Further research about other parts of China is needed to understand how the midwifery reform proceeded and took effect differently within the country, which might add knowledge to the history of global development of infant and maternal healthcare in the twentieth century.

## Notes

1. During the Republican era (1912–1949) the name of Beijing changed several times due to administrative reorganization and political upheavals. Before 1928 it was officially named 'Beijing', also known as 'Peking' and 'Jingshi', the latter of which meant the 'national capital'. The name was changed to 'Beiping' in 1928 when the national capital moved to the southern China. It was changed to 'Beijing' in 1937 during the Japanese invasion and was changed again to 'Beiping' after the war ended in 1945. The name was reverted to 'Beijing' in 1949 and has been maintained till today. The shifts of the name could be seen from the titles of the primary sources, but in this article I consistently refer the city to 'Beijing' in case of confusions.
2. It should be noted that the management of the first health district station of Beijing was subject to different governmental institutions in different years, due to the administrative reorganization and the changes of names of the institutions. In specific, the station was administered by the Metropolitan Police Department (1926–1927), the Metropolitan Health Bureau (1928–1929), the Metropolitan Police Bureau (1930–1933), the Metropolitan Health Department (1934) and the Metropolitan Health Bureau (1935–1938) successively. These variations could be seen from the titles of the primary sources.
3. Peking Health Demonstration Station (1927, p.14). Folder 2735, Box 219, Series 3, RG 5, International Health Board/Division records, FA115, Rockefeller Foundation records, Rockefeller Archive Center. *Beijingshi weishengju diyi weishengqu shiwusuo* (1938, p. 7).
4. 'Peking Health Demonstration Station (1927, p.13). Folder 2735, Box 219, Series 3, RG 5, International Health Board/Division records, FA115, Rockefeller Foundation records, Rockefeller Archive Center.
5. Peking Health Demonstration Station (1928, p. 19). Folder 2736, Box 219, Series 3, RG 5, International Health Board/Division records, FA115, Rockefeller Foundation records, Rockefeller Archive Center.
6. Peiping Health Demonstration Station (1929, p. 4). Folder 2737, Box 219, Series 3, RG 5, International Health Board/Division records, FA115, Rockefeller Foundation records, Rockefeller Archive Center.
7. The statistics of 1936 are missing because the report of this year is not found.
8. The result of the Independent Sample T-test shows that, based on the five-year data, the NMR of infants delivered by trained attendants ( $M = 0.0427$ ,  $SE = 0.0020$ ) was significantly ( $p < 0.05$ ) lower than that by untrained attendants ( $M = 0.0631$ ,  $SE = 0.0057$ ).

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## Appendices

### Appendix A. Vital Statistics (Population, IMR and MMR) of Beijing's first health district, 1926-1937

Year	Population	Number of births	Number of infant deaths	IMR(‰)	Number of maternal deaths	MMR(‰)
1926	51,189	1,277	234	183.2	15	11.8
1927	51,189	1,372	242	176.4	9	6.6
1928	97,877	781	154	197.2	10	12.8
1929	97,877	1,760	304	172.7	21	11.9
1930	106,574	1,842	262	142.2	12	6.5
1931	111,396	1,866	355	190.3	17	9.1
1932	117,941	2,494	447	179.2	16	6.4
1933	116,954	2,787	373	133.8	21	7.5
1934	120,680	2,836	358	126.2	19	6.7
1935	123,490	2,900	288	99.3	25	8.6
1936	120,491	2,901	433	149.3	15	5.2
1937	119,020	2,819	389	138.0	11	3.9

1. Source: Beijingshi weishengju diyi weishengqu shiwusuo (1938).
2. The statistics here are drawn from the summarized vital report that was published in 1938, covering information from 1926 to 1937. The summarized report recorded that the number of births in 1932 was 2492. But in the original vital table of 1932 (published in 1933), the birth number was 2494. It might be an error made by the composers when copying data from the 1933 publication to the 1938 publication. Here we use the number recorded in the original report of 1932.
3. The number of births of 1928 was exceptionally low because the collection of birth statistics was disordered during the reorganization of the district in this year.

## Appendix B. Vital statistics of Qinghe town (1931-1933) and Beijing (1934, 1938)

Year	Qinghe town			Beijing				
	Number of births	Number of infant deaths	IMR (‰)	Number of births	Number of infant deaths	IMR (‰)	Number of maternal deaths	MMR (‰)
1931	93	24	258.1					
1932	81	15	185.2					
1933	98	21	214.3					
1934				22,184	3,770	170	378	17.0
1938				24,657	4,538	184	235	9.5

Source: Li (1935, p.20, p. 23); Beipingshi weishengju (1935, p. 17); Beijing tebieshi weishengju (1939, table 21 and 22).

## Appendix C. Percentage of infants delivered by different birth attendants in Beijing's first health district, 1926-1937

Year	Physicians and new style midwives		Traditional midwives (all)		Traditional midwives (trained)		Traditional midwives (untrained)		Others		Unknown		Total
	Number of births	%	Number of births	%	Number of births	%	Number of births	%	Number of births	%	Number of births	%	Number of births
1926	218	17.1	693	54.3					330	25.8	36	2.8	1,277
1927	238	17.4	777	56.6					342	24.9	15	1.1	1,372
1928	171	21.9	433	55.5					176	22.5	1	0.1	781
1929	430	24.4	880	50.0					450	25.6	0	0.0	1,760
1930	553	30.0	753	40.9					536	29.1	0	0.0	1,842
1931	716	38.4	771	41.3					375	20.1	4	0.2	1,866
1932	833	33.4	1,060	42.5	708	28.4	352	14.1	601	24.1	0	0.0	2,494
1933	934	33.5	1,232	44.2	1,042	37.4	190	6.8	621	22.3	0	0.0	2,787
1934	1,228	43.3	1,092	38.5	947	33.4	145	5.1	516	18.2	0	0.0	2,836
1935	1,288	44.4	1,050	36.2	896	30.9	154	5.3	562	19.4	0	0.0	2,900
1936	1,404	48.4	880	30.3	709	24.4	171	5.9	617	21.3	0	0.0	2,901
1937	1,101	39.0	1,036	36.8	748	26.6	288	10.2	682	24.2	0	0.0	2,819
Average		35.6		41.6						22.6		0.2	

1. Source: Beijingshi weishengju diyi weishengqu shiwusuo (1938, p. 8).

2. It was not until 1932 that statistics of infants delivered by trained and untrained traditional midwives were recorded separately.