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*Research Article*

# Reconstructing historical fertility change in Mongolia: Impressive fertility rise before continued fertility decline

**Thomas Spoorenberg**

# Table of Contents

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*Research Article*

# Reconstructing historical fertility change in Mongolia: Impressive fertility rise before continued fertility decline

**Thomas Spoorenberg**[1]


## Abstract

**BACKGROUND**
To date, historical fertility change in Mongolia has been analyzed starting from the 1960s. It is generally accepted that the adoption of pro-natalist policies resulted in very high fertility levels during the 1960s and 1970s and that their relaxation in the mid-1970s contributed to the onset of fertility decline.

**OBJECTIVE**
The objective of this paper is to reconstruct fertility levels and trends in Mongolia before the 1960s in order to offer an alternative view of the historical fertility change in the country.

**METHODS**
Mobilizing a large set of data from different sources and applying diverse estimation techniques, a consistent reconstruction of nearly a century of fertility change in Mongolia is conducted. For the first time, fertility estimates before 1960 are introduced. The quality of these estimates is assessed through cross-comparison and prospective reconstruction of the country's population.

**RESULTS**
The different fertility estimates give a very consistent picture of historical fertility change in Mongolia, indicating that total fertility stagnated until the late 1940s and then increased by about 2.5 children per woman within 15 years. The population of Mongolia can be consistently reproduced assuming almost constant fertility between 1918 and 1956.

**CONCLUSIONS**
The improvement in health and living standards related to the establishment of a socialist society is the main factor explaining the variations in fertility before the 1960s in Mongolia. This study reinstates the importance of social and economic development in explaining fertility change in the country.


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[1] The views expressed in this article are those of the author and do not necessarily reflect the views of the United Nations. United Nations, U.S.A. E-Mail: thomas.spoorenberg@gmail.com.

**COMMENTS**

This study calls for demographers to reconstruct long-term population development in statistically less-developed countries to better understand the global process of fertility transition.

# 1. Introduction

The increasing number of population censuses and sample surveys significantly improve our knowledge of recent demographic changes in statistically less-developed countries. The availability of large survey programs and the recommended inclusion of specific questions in census questionnaires have improved the estimation of child mortality and fertility levels and trends. In the statistically less-developed countries, demographic changes since the 1980s are now somewhat better documented, but deriving demographic estimates for earlier periods still remains a challenging task. The limited number of available demographic data sources constitutes one of the main difficulties facing demographers. In addition, this early fragmentary demographic evidence often has important data quality limitations. Yet the increasing number of population data sources also allows for a renewed comparison and cross-validation of demographic estimates, and a better understanding of past population processes.

Thanks to consistent population statistics, the demographic development of Mongolia is well documented from the 1970s to the present (Gereltuya 2008; Neupert 1992, 1996; Mungunsarnai and Spoorenberg 2012; Spoorenberg 2009, 2014a). However, much less is known about the earlier decades of the 20th century. Thus most of the studies of fertility change in Mongolia have focused on the fertility decline that started in the country in the mid-1970s (Gereltuya 2008; Neupert 1992, 1994; Spoorenberg 2009). So far the political factor has received most consideration when explaining fertility change in the country (Gereltuya 2008). The very high fertility levels of the 1960s until the mid-1970s are understood as the result of the pro-natalist policies adopted by the socialist government, consisting in generous benefits to families having children. Therefore the onset of the fertility decline in the mid-1970s is explained by the changes made in these pro-natalist policies. While the policy factor certainly contributes to explaining the fertility levels and trends in Mongolia, giving primacy to this factor in the explanation of the fertility change in Mongolia is short-sighted.[2]

[2] Such interpretation is, however, openly questioned by Spoorenberg (2009: 145), who considers the onset of fertility decline in Mongolia as an illustration of the classical demographic transition theory that postulates a reproductive adjustment/response (fertility decline) to earlier mortality decline.

The objective of this paper is to reconstruct fertility levels and trends in Mongolia before 1960 in order to offer an alternative view of historical fertility change in the country. The paper opens with an overview of the development of Mongolia's population during the 20th century. It shows that population growth was very low until the late 1940s as a result of a combination of high mortality levels and fertility levels that were well below the historical peak of the 1960s and 1970s. The data used and the methods applied to reconstruct fertility change in the country are then introduced. Mobilizing a large set of data from different sources and applying diverse estimation techniques, a consistent reconstruction of nearly a century of fertility change in Mongolia is conducted. The third section presents the fertility estimates. Their quality is assessed through 1) cross-comparison, and 2) prospective reconstruction of Mongolia's population between the 1918 and 1956 censuses, using three fertility variants. The comparison of different fertility estimates returns a very consistent picture of historical fertility change in Mongolia, indicating that total fertility stagnated until the late 1940s before embarking on an impressive increase of around 2.5 children per woman within 15 years, followed by a plateau until the mid-1970s, and thereafter a rapid decline. The prospective population reconstruction shows that the population enumerated in the 1956 census can be consistently reproduced assuming almost constant fertility levels and trends between 1918 and 1956, thus validating the quality of the new fertility estimates introduced in this analysis. The factors behind the pre-decline fertility rise in the country are then discussed. It is shown that the impressive pre-decline fertility rise is primarily the result of improvements in health and living standards leading to a reduction in infertility. The conclusion discusses the implications of the new evidence for the interpretation of historical fertility change in Mongolia and closes with the need for demographers to reconstruct long-term population development in statistically less-developed countries in order to further document the pool of national experiences of the demographic transition and better understand past, present, and future population change.

## 2. Population and development in Mongolia during the 20th century

Having been the largest empire in world history under Genghis Khan in the 13th century, for over two centuries (1691−1911) Mongolia was the vassal of the Chinese Qing dynasty. At the fall of Qing dynasty in 1911, Mongolia declared its independence under the *Bogd Khan*, the spiritual leader of Mongolian Tibetan Buddhism. The following decade saw China invading Mongolia in 1919 and a People's Revolution backed by Russian Red Army in 1921. In 1924, with the adoption of the first socialist constitution, the Mongolian People's Republic was proclaimed, becoming the first nation of the world (after the founders of the USSR - Russia, Ukraine, Belarus, and Transcaucasia) to choose a socialist way of development. The country continued under a socialist political and economic system for almost 70 years, until the resignation of the Mongolian politburo in early March 1990 following peaceful democratic demonstrations. The first democratic election was held in July 1990. The end of socialism and the transition to a market economy was accompanied by a deep economic and social crisis.

The Mongolian socialist experience during the 20th century can be divided into two phases. The first stage, which lasted till the mid-1940s, was characterized by political and economic hesitation, and experiments with the collectivist Soviet model failed to produce significant achievements. The 1930s saw the establishment of several small factories, a forced collectivization of the pastoral economy (with confiscation of herds and rural properties), and the nationalization of trade, commerce, and retail distribution. The latter choice proved to be disastrous for Mongolia and was soon revoked by the government: the collective farms collapsed, the number of livestock declined swiftly, consumer goods faced shortages, and prices rose sharply (Bruun and Odegaard 1995; Neupert 1996). Alongside these socioeconomic experiments, in 1931 there was an administrative re-organization of the country into 18 *aimags* (provinces), each with 15 to 25 *sums* (districts). Most of the sums profited from the development of administrative, health, and education infrastructures centralized in one location.

The second phase of Mongolia's socialist experience began after World War II. The country modernized as a result of planned economic development linked to industrialization and urbanization. At the 11th Congress of the Mongolian People's Revolutionary Party in 1948, the First Five-Year Plan (1948−1953) was launched with the aim of developing a centrally planned economy based on industrialization and the collectivization of agriculture. The Second Five-Year Plan (1953−1958) and the Three-Year Plan (1958−1960) strongly reaffirmed the objective of the collectivization of whole agricultural sectors. By 1959, 97.7% of households were affiliated to a *negdel* (association) and the collectivization of pastoral life was complete (Atwood 2004: 115). From the Third to the Seventh Five-Year Plans, from 1961 to 1985, the aim of the government was to develop a modern industrial economy (as the real basis for economic and social progress). During this second development phase, significant progress was made in education and health. The state educational structure initially established during the 1930s expanded steadily during the 1940s and 1950s. According to official figures, literacy among those aged 9 to 50 rose from 24% in 1940 to 60% in 1947 and 95% in 1956 (Atwood 2004: 379). During the 1950s the male-female literacy gap was eliminated among the population aged 35 and below (State Statistical Office of Mongolia 1994). By 1979, 50% of all primary school graduates and 37% of those with some secondary and higher education were women (State Statistical Office of Mongolia

1994). As the rural population maintained its nomadic way of life, boarding schools for herders' children were established in every sum center. The first hospital in Mongolia was built in 1926 (Rossabi 2005: 167) and from the early 1930s a public health system was developed, with Soviet doctors helping to set up a local healthcare network (Baabar 2005). Between the early 1950s and the early 1970s life expectancy increased by more than 13 years, mostly as the result of a significant decline in under-5 mortality. Yet from the 1970s, as in most Soviet countries, this early progress in health declined (Spoorenberg 2008) and was followed by a health crisis in the 1990s (Mungunsarnai and Spoorenberg 2012).

### 2.1 Population development

The two main phases of development in Mongolia in the 20th century had a profound impact on population development. The population of Mongolia quadrupled between 1918 and 2010, from 0.648 million to almost 2.65 million, also in two distinct periods.

The first period up until the 1940s was characterized by relative population stagnation or limited population growth. During the first half of the 20th century the population of Mongolia experienced very low population growth rates (Table 1). Between 1918 and 1956 the annual population growth rate reached 0.95% at most, at which rate the population would require more than 73 years to double.[3] This first period corresponds closely to the political and economic stage of hesitation and experimentation with the collectivist Soviet model, which resulted in no significant achievements.

From the late 1950s to the 1980s unprecedented growth rates meant that the population doubled in less than 26 years. The 1963 census showed that the population had passed the one million mark. The two million mark was reached 26 years later in 1989. This substantial population increase corresponds to the collectivization and modernization process in the country (1958−1990), whereas the transition to democracy and a market economy in the 1990s was accompanied by a significant reduction in the rate of population increase, which lasted throughout the first decade of the 21st century.

[3] The low population growth during the turbulent period between the 1935 and 1944 censuses should be interpreted in the light of the political and religious repression in the country. According to some estimates, between 20,000 and 30,000 people (about 3% to 4% of the population) were killed between late 1937 and early 1939 (Kaplonski 2002).

**Table 1: Date, total population, average annual growth rate and doubling time, population censuses, Mongolia**

| Census date | Total Population (in thousand) | Average annual growth rate (per cent) | Time required for the population to double (in years) |
|---|---|---|---|
| *Population Census* | | | |
| 1918 | 647.5 | — | — |
| 1 June 1935 | 738.2 | 0.78 | 89 |
| 15 October 1944 | 759.1 | 0.30 | 233 |
| 5 February 1956 | 845.5 | 0.95 | 73 |
| 1 May 1963 | 1,017.2 | 2.56 | 27 |
| *Population and Housing Census* | | | |
| 10 January 1969 | 1,197.6 | 2.87 | 24 |
| 5 January 1979 | 1,595.0 | 2.87 | 24 |
| 5 January 1989 | 2,044.0 | 2.48 | 28 |
| 5 January 2000 | 2,373.5 | 1.36 | 51 |
| 1 November 2010 | 2,647.6* | 1.01 | 69 |

*Note*: * Mongolians living in Mongolia (excluding the Mongolians living abroad for more than six months who could participate to the 2010 census on a voluntary basis)[4].
*Data source*: NSO 2003: 77 & 85-86; NSO 2012.

These two phases indicate that the country went through the successive stages of the demographic transition during the 20th century. The large population increases between the mid-1950s and the late 1980s should be understood in the context of the increased life expectancy that was taking place at the time. By contrast, the reduction in the population growth rate from the 1990s was mainly driven by changes in fertility.[5] According to Riley (2005), the health transition in Mongolia that started in the 1940s was the result of the development of infrastructure across the country. Infrastructure development in sum centers resulted in the concentration of population around

[4] Mongolians living abroad for more than six months could participate to the 2010 census on a voluntary basis through the internet (after having received a username and password). 107,140 Mongolians living abroad for more than six months decided to take part to the 2010 census, bringing the figure of the total population to 2,754,685 − the official figure retained by the government for the 2010 census.
[5] Like other former socialist countries, Mongolia experienced a health crisis with significant adult mortality increase (mainly for men) during its transition to democracy and a market economy. This mortality increase contributed to reducing the rate of population increase (Mungunsarnai and Spoorenberg 2012).

administrative clusters. The collectivization and modernization that followed brought further impressive development in urbanization and sedentarization. Between 1956 and 1969 the urban population almost trebled in Mongolia, whereas the rural population did not increase (Tsogtsaikhan 2001).

The population development of Mongolia provides important information for the expectations of long-term fertility trends in the country, especially for the decades prior to the 1950s. Based on existing estimates of child mortality in Mongolia for the first half of the 20$^{th}$ century, three to four children out of ten would die before reaching their fifth birthday. Given such mortality figures, and with modest net migration, the very low population growth before 1950 can only be explained by low fertility levels.

## 3. Data and methods

This study is based on an extensive series of estimates of total fertility, derived from the application of direct and indirect estimation methods to population statistics available from the vital registration (VR) system, population and housing censuses, and household sample surveys.

Population statistics from the 1944, 1956, 1963, 1969, 1979, 1989, 2000, and 2010 population and housing censuses of Mongolia, as well as population data from the VR system for the 1930s, are used to reconstruct fertility changes since 1928. Mongolia's VR system was originally set up in the 1930s, but is considered reliable only from the 1960s.[6] However, there has been no formal assessment of its consistency during this period. Neupert (1992) carried out the only formal assessment by applying the consistent correction method developed by Luther and Retherford to VR data for the 1970s and 1980s. As no VR-based fertility data is publicly available before 1963, other types of method were used to estimate fertility levels and trends in the earlier years.

The number of household births during the twelve months preceding the census is only available in the 1989 census: therefore fertility changes had to be estimated using indirect demographic techniques. The following demographic methods to estimate fertility were used to reconstruct the fertility levels and trends in Mongolia: reverse survival method of fertility estimation, cohort fertility based on the number of children ever born classified by the age of the mother, and adjusted total fertility based on the child-woman ratio.

The reverse survival method of fertility estimation is one of the most parsimonious methods to estimate fertility. It requires a population distribution by (single-year) age

[6] The collection of statistics was legally institutionalized in 1924 by the establishment of a division composed of six persons. In 1941 the Department of Planning, Statistics, and Inspection was established, followed by the official creation of the Central Statistics Office in 1960.

and sex from a survey or census, together with a set of estimates of mortality and age-specific fertility patterns (Timæus and Moultrie 2013). Population by single-year age and sex from population censuses are available from the National Statistical Office of Mongolia (State Statistical Office of Mongolia 1994; NSO 2001, 2012). The Excel template FE_reverse.xlsx, provided with Timæus and Moultrie (2013), was used to estimate total fertility. The fertility estimation was performed using the Coale-Demeny West Model, using estimates of mortality levels ($5q0$ and $45q15$) taken from the *World Population Prospects: The 2012 Revision* (United Nations Population Division 2013). The age-specific fertility rates needed to distribute the number of births by women's age group were also taken from the World Population Prospects and for the years before 1950 it was assumed they remain constant at their 1950−55 levels, as estimated by the United Nations Population Division (2013). The quality of the fertility estimates produced by the reverse survival method depends mostly on the quality of the age declaration and on the effect of international migration (Spoorenberg 2014b). For most of the 20th century international migration was limited in Mongolia and, given the importance of knowing one's age for cultural and religious purposes and the importance of documents in socialist regimes, age data is of good quality in Mongolian population censuses (Spoorenberg 2007). For these two reasons, the application of the reverse survival method of fertility estimation to the 1956, 1963, 1969, 1979, 1989, 2000, and 2010 Mongolian population censuses should produce consistent fertility estimates.

The second indirect method that was applied to estimate fertility is cohort fertility. This method uses the number of children ever born by age of the mother. Using Ryder's correspondence between period and cohort measures (Ryder 1964, 1983), the mean number of children ever born (CEB) to a cohort is used to approximate total fertility at the time this cohort was at its mean age at childbearing. The time translation of the mean CEB number for women age 45 and over was made using a mean age at childbearing of 28 years (for details of time translation see Feeney 1995, 1996, 2014). CEB data are available for the 1979 and 1989 population censuses. For the 1979 census, CEB are available up to the age group of 45−49 (NSO 2003), so the data from two age groups (40−44 and 45−49) were used to estimate the cohort fertility. For the 1989 census, a census sample is available in IPUMS-International (Minnesota Population Center 2014) and CEB by single year of age. CEB data were used from age 45 to age 90.

Another set of fertility estimates are based on the child-woman ratio (*CWR*) derived from official population data. In its classic use, the child-woman ratio uses the child population, usually the age group 0−4, and the female population age 15−49. The child-woman ratio is not an indicator of fertility per se, but an indicator of a population age structure. In order to obtain an estimate of total fertility for a given year based on the child-woman ratio (called here $TF^{CWR}$), the child population should be divided by *n*, the number of ages in the age group. The division by $n$ is required as the child population includes the sum of children from age $x$ to $x+n$ (usually ages 0 to 4). When the age group 0−4 is used as the child population, $n$ equals 5. With 5-year age group population data, $TF^{CWR}$ is computed using:

$$TF^{CWR} = \frac{{}_5P_0/5}{\sum_{x=15}^{45} {}_5P_x^f} \quad (1)$$

where $P$ is the population in age group $x$, $x+5$, and $P^f$ the female population.

In this form, *CWR* will underestimate the level of fertility, as children who have died at young ages are missing from the numerator. In high mortality settings a large number of children would be missing and fertility would be significantly underestimated. If the child-woman ratio is to be used to estimate total fertility, formula (1) needs to be adjusted in order to account for infant and child mortality. Since total fertility estimated using the child-woman ratio is computed for only one given year, there is no (or less) need to adjust for the effect of mortality of the female population age 15−49 in the denominator. Such adjusted total fertility based on the child-woman ratio (*adj.* $TF^{CWR}$) was applied to data from the 1944 population census (State Statistical Office of Mongolia 1994) and official population data by age and sex for the years 1930, 1931, 1935, 1936, 1937, 1939, and 1940 (Gantumur 1977). For each of these years, the infant and under-5 mortality required for adjusted $TF^{CWR}$ was estimated through linear interpolation based on mortality estimates from 1915 and 1950−1955. A study in 1915 gives a mortality level before age 4 of 390 per 1000 in Mongolia (Murphy 1966: 66). According to the Coale and Demeny West Model Life Table, this value corresponds to a life expectancy of 29 years and an infant and under-5 mortality of 273 and 401 per 1000, respectively. In other terms, 40% of the children born in Mongolia in 1915 would die before reaching age 5. For 1950−1955, the mortality indicators are taken from the estimates available in the *World Population Prospects: The 2012 Revision* (United Nations Population Division 2013). According to this source, infant and under-5 mortality reached 183 and 294 per 1000 respectively in Mongolia in the early 1950s.

Table 2 gives an overview of the different data sources and data used in reconstructing past fertility trends in Mongolia, the estimation methods applied, and the period covered by each data source.

**Table 2: Overview of the reconstruction of fertility trends in Mongolia**

| Data sources | Data used | Estimation method | Period covered |
|---|---|---|---|
| Official data | Population by age and sex | Adjusted child/women ratio | 1930−1940, selected years |
| 1944 Census | Population by age and sex | Adjusted child/women ratio | 1944 |
| 1956, 1963, 1969, 1979, 1989, 2000, 2010 Census | Population by single-year age and sex | Reverse survival | 1941−2010 |
| 1979, 1989 Census | Number of children ever born by age of mother | Cohort fertility | 1928−1968 |

*Note*: See text for details.

### 3.1 Quality of fertility estimates

Several factors can ultimately affect the quality of the fertility estimates derived from the different methods used in reconstructing historical fertility change in Mongolia (Table 2).

Age and sex population structures collected in population and housing censuses display different data quality patterns. Some of the most common patterns in the statistically less-developed countries are population under-enumeration at select ages and age-heaping on selective age digits. Such patterns can potentially affect fertility estimates that are based on a population age structure. A typical pattern in population censuses conducted in statistically less-developed countries is the under-representation of young children. Estimating fertility using the age and sex population structure (see Table 2) will ultimately lead to a possible underestimation of the level of fertility.

Mortality is another factor that can affect the estimation of the level of fertility using the population structure. Both the adjusted $TF^{CWR}$ and the reverse survival method require an estimate of the level of mortality to derive fertility estimates. The use of too low a level of mortality results in adding too few births in the population, thereby underestimating the level of fertility that is ultimately derived. As described above, Coale-Demeny model life tables were used. Yet, despite the fact that these models cannot possibly fully account for the peculiarities of Mongolia's age patterns of mortality in the early 20$^{th}$ century, this only minimally affects the estimation of the fertility level. In fact, the adjusted $TF^{CWR}$ is computed using an under-5 mortality rate − a value for which the Coale-Demeny model life tables differ little. On the other hand the reverse survival fertility estimates are affected only marginally by the selection of a wrong level and age patterns of mortality (Spoorenberg 2014b). Commonly, data on the number of children ever born are affected by some kind of recall lapse: women tend to forget to report some of their children born a number of years previously (United Nations Statistics Division 2004). Furthermore, information on the number of children ever born is collected from surviving women. It is therefore possible that mortality selection is contributing to the underestimation of fertility when relying on cohort fertility, because the reproductive experiences of women who have had a higher number of children are not accounted for (as these women have been subjected to higher mortality risks delivering a higher-order birth). These two factors therefore contribute to the underestimation of levels of total fertility, using cohort fertility estimates based on information on the number of children ever born to women age 45 and older.

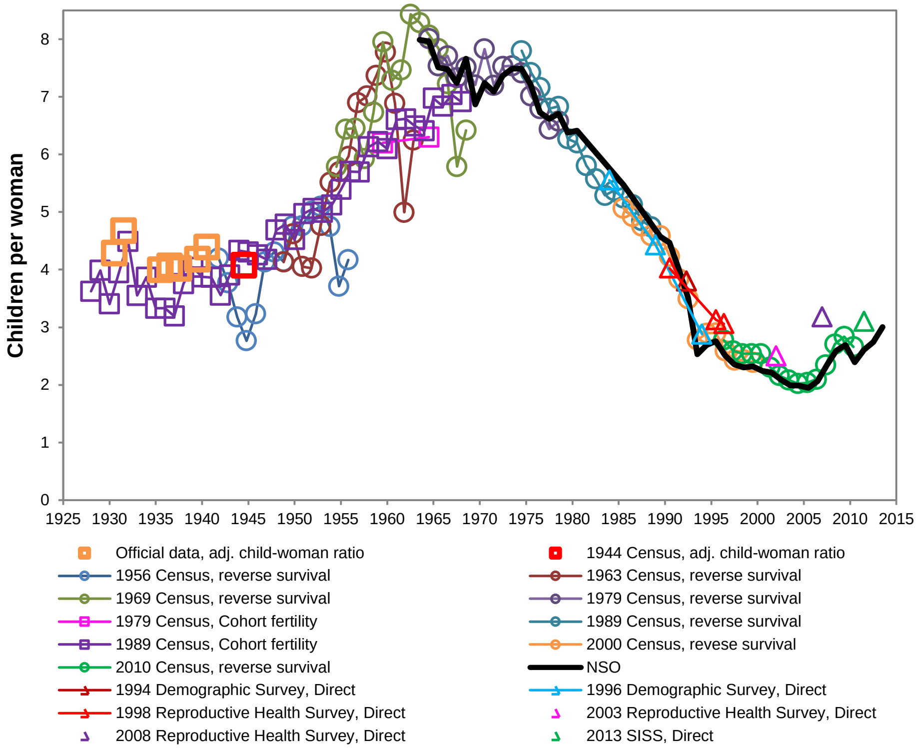
Migration can also distort the quality of the fertility estimates given by each method. For the methods based on population by age and sex, the departure or arrival of female population can potentially result in overestimating or underestimating the level of fertility, respectively. Yet migration affects the estimation of fertility only when female migrants leave their children behind (thus only affecting the denominator) or when female migrants have a number of children that is significantly higher or lower (thus only affecting the numerator). Finally, migration can affect the estimation of fertility based on the number of children ever born if the number of children ever born works as a selection mechanism to migration. Yet, for all estimation methods, only the migration of large portions of the female population affects the estimation of fertility. In the case of Mongolia, international migration was limited and should therefore not significantly affect the fertility estimates.

## 4. The evidence

The application of the estimation methods described above to the population statistics of Mongolia produces estimates of total fertility that are generally consistent. Figure 1 presents all the estimates that could be produced based on the available data sources, so reconstructing fertility change over 85 years in Mongolia.

Despite variations between sources, the fertility estimates displayed in Figure 1 describe a highly consistent picture of historical fertility change. Based on the information on the number of children ever born to women age 45 and older, the cohort fertility estimates of total fertility indicate that total fertility stagnated during the 1930s and 1940s. Such stagnation is further corroborated by the estimates of total fertility based on the adjusted child-woman ratio, but at somewhat higher levels of around 4.5 children per woman. However, given the potential data quality issues related to these data, it is likely that these fertility levels underestimate the level of fertility in Mongolia.

**Figure 1: Estimates of total fertility from various sources and methods, Mongolia, 1928−2013**




*Sources*: see text for details.

Total fertility stood at levels as high as 7–7.5 children per woman from the late 1950s to the mid-1970s, before embarking on an impressive fall. Estimates of total fertility from all data sources and methods are highly consistent and corroborate the drop in fertility. Since its nadir in 2005, total fertility has been increasing.

The application of distinct estimation methods to different data sources produces estimates of total fertility between 1928 and 2013 that offer a consistent picture of fertility change over the last 85 years in Mongolia. Whereas confidence can be placed in the quality of the levels and trends of total fertility in the second part of the 20th century (Neupert 1992; United Nations Population Division 2013; Spoorenberg 2009, 2014a), the consistency of the earlier estimates of total fertility needs to be further assessed.

## 5. Checking the consistency of the fertility estimates using prospective population reconstruction

While the population of Mongolia can be well reproduced starting from 1950, based solely on the national official fertility and mortality data and no international migration,[7] no attempt has been made to try to reconstruct the population of the country for the preceding decades. In order to assess the consistency of the fertility estimates introduced in the previous section, an attempt was made to reconstruct the population development of Mongolia between 1918 and 1956.

The cohort component method was used to reconstruct prospectively the population of Mongolia during the first half of the 20th century. The population enumerated in the 1918 census was projected to 1956 and compared to the population structure enumerated during the 1956 census. No information on the age and sex structure is available from the 1918 census, only a figure for the total population. The age and sex structure in 1918 was therefore estimated using stable population models. The age percentage distribution given by the Coale-Demeny West Model under a growth rate of 0.5% was used (Coale, Demeny, and Vaughan 1983). The levels of life expectancy at birth were estimated for each sex based on the under-5 mortality derived linearly between available estimates in 1915 and 1950−1955 (see Section 3) and using a sex ratio at birth of 1.06 and a sex ratio of under-5 mortality of 1.1. The age patterns of mortality estimated by the United Nations Population Division for the period 1950−1955 were prorated in order to match these mortality levels. International migration was not accounted for in the population reconstruction.

While Figure 1 indicates that fertility oscillated around 4.5 children per woman between the late 1920s and early 1950s, this evidence is based on data that likely underestimates the 'true' level of fertility: cohort fertility estimates based on children-ever-born data collected from older women are likely to suffer from recall lapse and female survival selection, and the number of births (or population at young ages) are likely to be under-reported in official statistics. In order to test the consistency of these estimates of total fertility, three simple fertility variants were formulated. The first variant assumed that the total fertility rate would remain stable at 4.5 children per woman between 1918 and 1940, drop to 3.5 in 1942 (accounting for a lagged effect on fertility of the turbulent period of the late 1930s), rebound to 4.5 by 1945, and increase linearly thereafter to reach 5.5 in 1956. The second variant assumed a TFR level of 5 children per woman between 1918 and 1940, a drop to 3.5 children per woman in 1942, followed by a rebound to 5 by 1945 and a subsequent linear increase to reach 5.5 children per woman in 1956. In the third variant, the total fertility rate stays constant at

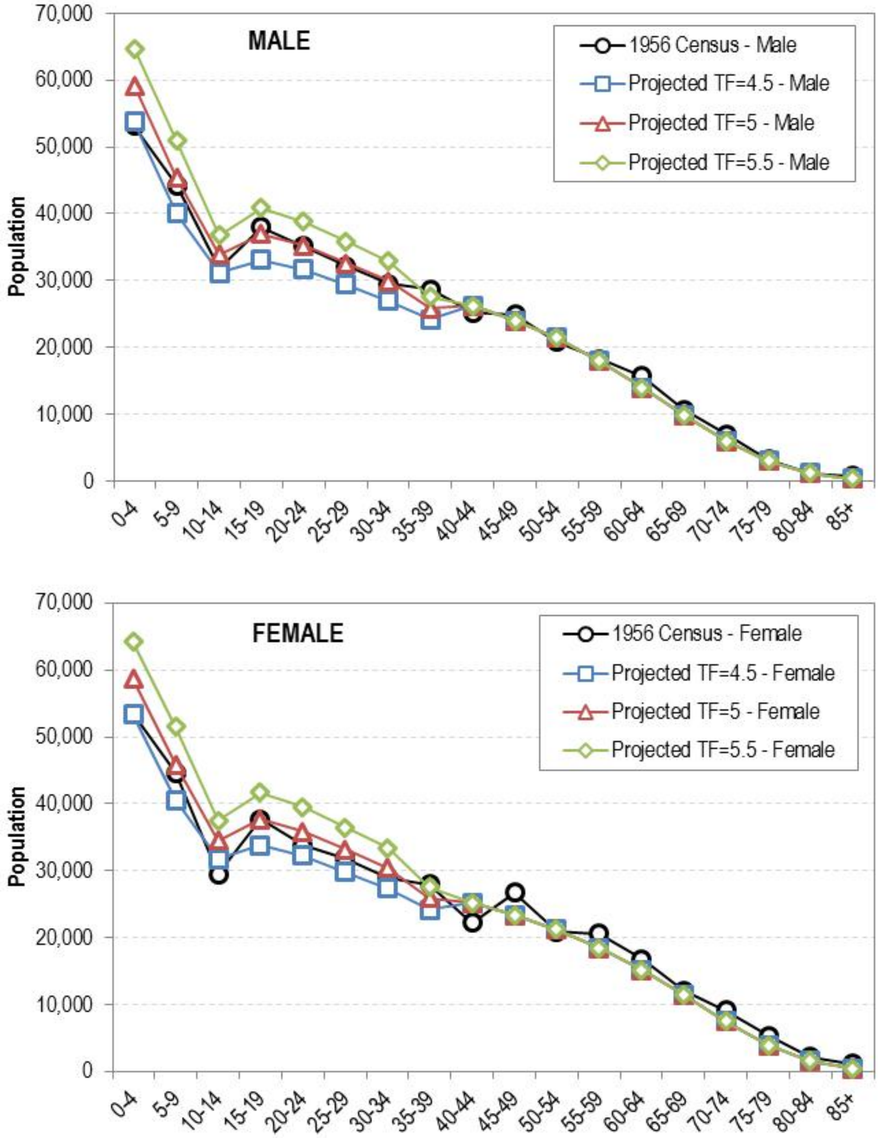
[7] See the population estimates and the data sources used by the United Nations Population Division to reconstruct prospectively the population development of Mongolia between 1950 and 1990.

5.5 children per woman from 1918 to 1940, drops to 3.5 children per woman between 1940 and 1942, returns to 5.5 children per woman in 1945, and remains at this level until 1956. Although simple, these three variants allow us to test how well the population by age and sex enumerated in the 1956 census can be reproduced.

The population structures obtained in 1956 under each fertility variant are presented in Figure 2. The population structure obtained from the prospective reconstruction assuming a fertility level of 5 children per woman is the closest to the 1956 census data. Under the assumption of a TFR of 4.5 or 5.5 children per woman, the resulting population structure corresponding to the projection horizon (population below age 40) in 1956 is systematically under or above the census series, respectively. Furthermore, the population over age 45 in 1956 is closely reproduced, validating henceforth the reconstruction of the 1918 census population age structure using stable population models.

What these prospective population reconstructions show is that the development of the population of Mongolia can be reconstructed fairly well using existing data and straightforward assumptions. Furthermore, they give a robust verification of the consistency of the fertility levels estimated based on the reverse survival method, the number of children ever born (cohort fertility), and the child/woman ratio (Figure 1), accounting for underestimation.

**Figure 2: Comparison of the population structure observed in the 1956 Census and the population prospectively reconstructed under different fertility scenarios at the same date, Mongolia**



## 6. Toward an explanation of rising fertility before the continued fertility decline in Mongolia

The level of fertility in Mongolia remained fairly stable at around 5 children per woman until the late 1940s, when an unprecedented increase took place. In the 10−15 years that followed, more than 2 children per woman were added to the fertility level. How can this pre-decline fertility rise be understood?

Rising fertility trends before the onset of fertility decline at times of social and economic development have been documented for both developed and developing countries (Nag 1980; Romaniuk 1980, 1981; Dyson and Murphy 1985; Saito 2006; Garenne 2008; Ortega 2009; Reher and Requena 2014). Social and economic development can influence fertility-related factors in two opposing directions. On the one hand, it can increase fertility by unleashing women's childbearing potential through reducing or removing a series of biological and behavioral fertility checks. On the other hand, social and economic development can put in motion forces that encourage the adoption and spread of fertility control. Earlier studies have shown that the two series of factors can influence fertility sequentially and result in a temporary increase in fertility when the forces towards the adoption and spread of fertility control are too weak to counterbalance those unleashing women's childbearing potential.

A change in marriage patterns, birth intervals (breastfeeding and postpartum abstinence), and disease-related fertility can explain the rising trend in fertility during the 'opening phase' of the fertility transition (Nag 1980; Dyson and Murphy 1985).

### 6.1 Marriage patterns

In populations where marriage grants access to reproduction and where no effective form of birth control exists, a change in marriage patterns can influence the level of fertility. In such settings it is likely that an increase in the proportion of women getting married will translate into a rise in fertility.

Unfortunately, no data are available on changes in marriage patterns in Mongolia before the 1960s. Survey data show that the female mean age at first marriage was on average just below age 20 until 1975, when it started to increase. Although such an increase is related to a decline in fertility (Gereltuya 2008), it is not possible to determine, without further evidence for the earlier years, whether the survey estimates for the late 1960s indicate a historical nadir consistent with an earlier marriage surge resulting in a fertility increase.

At the beginning of the 20th century a large portion of the adult male population were Buddhist monks (lamas). According to the 1918 census, 105,577 men, or 44.8%

of the male population, were registered as lamas (Atwood 2004: 325). This feature could have affected the marriage pattern and thus the production of children. The anti-religious propaganda of the 1920s and 1930s, which culminated in the destruction of the lamaist clergy during the political and religious repressions of the late 1930s, probably contributed to increasing fertility in the late 1940s, as more young men became available to marry.

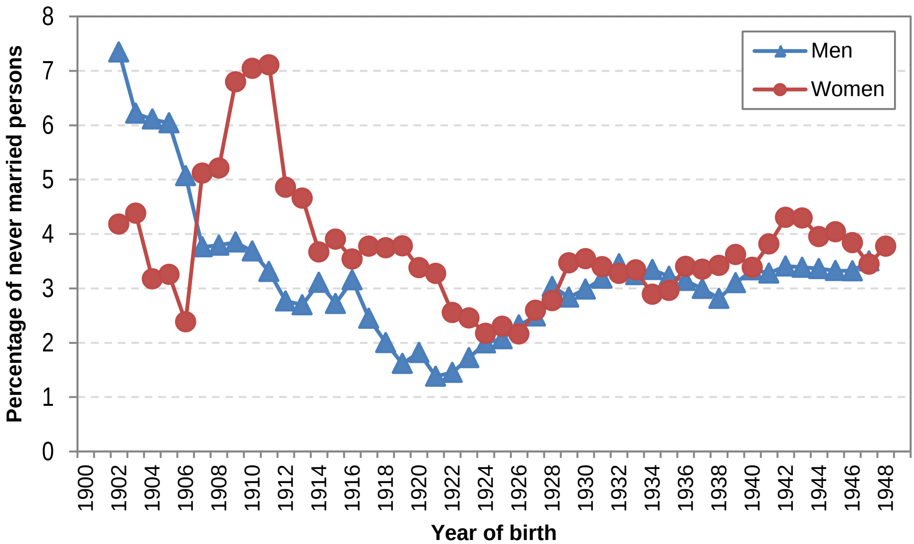
Data on marital status from the 1989 census was used to investigate this theory. Figure 3 shows the percentage of women and men who remained single at age 40 and over by year of birth. Both sexes experienced a decline in the percentages of never married among the cohorts born in the first decades of the 20th century. Such declines are consistent with what was happening to the lamaist clergy during the 1930s, when more men became available to marry.[8] What Figure 3 reveals is that more women born in the late 1910s and 1920s married. If one assumes that women were getting married on average around age 20[9], this pattern is consistent with the fertility increase in the late 1940s. However, the percentage of never-married women was reduced at most by half to a third from a level peaking at around 7%. Such a decline is therefore likely to have contributed only marginally to the increase in fertility.

Other reasons also support the minor role of marriage in explaining the fertility increase that started in the late 1940s in Mongolia. First, a large proportion of the lamas were educated in monasteries and so bore the status of lamas, but returned to the steppe in their late teens to settle down with wives and children (Atwood 2004: 325). The actual monastery residents more likely constituted around 20% of the male population (Atwood 2004: 325).[10] Furthermore, many of the lamas were "only very nominally celibate" and their sexual behavior contributed to the spread of venereal diseases (Bawden 1968: 146). Second, "traditionally, Mongols valued fertility over virginity and did not share the obsessive concern with female purity found in much of Southwest, South, and East Asia" (DeGlopper 1991: 95).[11] Indeed, marriage does not constrain fertility in Mongolia as it does not traditionally sanction the production of children, but is more related to the ability to establish a new *ger* (or yurt—the Mongol traditional nomadic felt tent). The high prevalence of sexually transmitted diseases recorded in the early decades of the 20th Century in Mongolia (see below) is testimony to the fact that sexual relations, and therefore childbearing, were not bound to marriage. It is therefore

[8] The difference between sexes can be understood as the result of the age gap between spouses.
[9] The legal marriage age was 18 in socialist Mongolia.
[10] This figure seems to have slightly increased, however, following the efforts during the 1920s to strip married lamas of their privileges (Atwood 2004: 325).
[11] The control of chastity and illicit sexual relations were originally important in Mongol society, but declined over the centuries. According to Jagchid and Hyer (1979: 154), the decline "occurred concurrently with the weakening of the patriarchal system and more particularly with the spread and almost universal domination of Lamaist Buddhism, because of which large numbers of the male population joined celibate monastic centers".

likely that marriage played at most a marginal contribution in explaining the fertility increase that began in the late 1940s.

**Figure 3: Percentage of never-married women and men age 40 and over, Mongolia**




*Source*: computed from 1989 Census micro data (Minnesota Population Center 2014).

## 6.2 Birth intervals

Whereas marriage is likely to have had little influence on the level of fertility in Mongolia, change in the factors affecting birth intervals could have caused fertility to rise. Change in the practice of breastfeeding and the removal of postpartum abstinence could reduce the interval between births and contribute to increased fertility.

A detailed examination of the contribution of the change in breastfeeding and postpartum abstinence is difficult to conduct for Mongolia due to lack of data. According to an ethnographic account of life in Mongolia during the 1920s, breastfeeding was practiced until the children reached the age of 4−5 (Vreeland 1973: 73). However, breastfeeding was not performed exclusively by the biological mother, but sometimes by extended relatives, grandmothers, or neighbors (Vreeland 1973: 73).

Under such circumstances it is likely that the effect on fertility of lactational infecundability through prolonged breastfeeding was limited.

The nomadic way of life of a large portion of the Mongolian population in the early decades of the 20th century could have had implications for birth intervals. While nomadism in Mongolia involved traditionally few moves during the year and included the whole family (implying no seasonal separation of the husband from the wife), the nature (amount and type) of female work in a nomadic household[12] together with the required moves could contribute to a higher incidence of miscarriage (Henin 1969). The settlement of the population from the 1940s, due to the progressive institutionalization of social and economic life that ultimately lead to the complete collectivization of the economy in the late 1950s-early 1960s, could therefore have contributed to increased fertility (Roth 1985). The administrative and institutional changes that took place in Mongolia, from the development of infrastructure in sum centers starting in the 1940s to the collectivization and modernization processes from the late 1950s, resulted in a concentration of the national population in urban clusters. By improving health and living conditions, as well as reducing some of the burdens related to the moves and gendered tasks required by nomadic life, the general improvement in living standards related to the sedentarization of the country's population in urban areas contributed to the reduction of the length of birth intervals (as the incidence of miscarriage declined), and so increased fertility.

### 6.3 Disease-related infertility

The general development of living standards translated into improved health. Together with the change in diet and the availability of new medicines, the development of health infrastructure and services had a positive effect on the ability of women to bear and successfully deliver children. Among the multiple health-related factors that can potentially determine the level of fertility, several studies have documented the link between sexually transmitted diseases and infertility (Belsey 1976; Gray 1979; McFalls and McFalls 1984). In a population with little practice of any effective form of birth control − especially among women who have not yet borne children − a high percentage of childlessness can provide strong evidence of pathological sterility (Romaniuk 1980). A decline in the prevalence of sexually transmitted diseases can

[12] Jagchid and Hyer (1979: 111) note that "[t]he women's work is comparatively heavier than that of men, and they are generally more diligent in getting it done".

therefore increase the proportion of women having children[13] and push up the level of fertility.

Up to the 1940s, Mongolia was plagued by sexually transmitted diseases (Murphy 1966: 61; Bawden 1968: 146 & 380; Jagchid and Hyer 1979: 99−100).[14] During the 1930s the Mongolian health system developed significantly. The country had ten hospitals in 1940 compared with only one hospital in 1930 (Bawden 1968: 380). After World War II effective antibiotics to treat sexually transmitted diseases became available and in 1947 special venereal hospitals were opened (Bawden 1968: 380). The social and economic development that began before World War II led to further health improvement that resulted in a reduction of infertility and a rise in fertility.

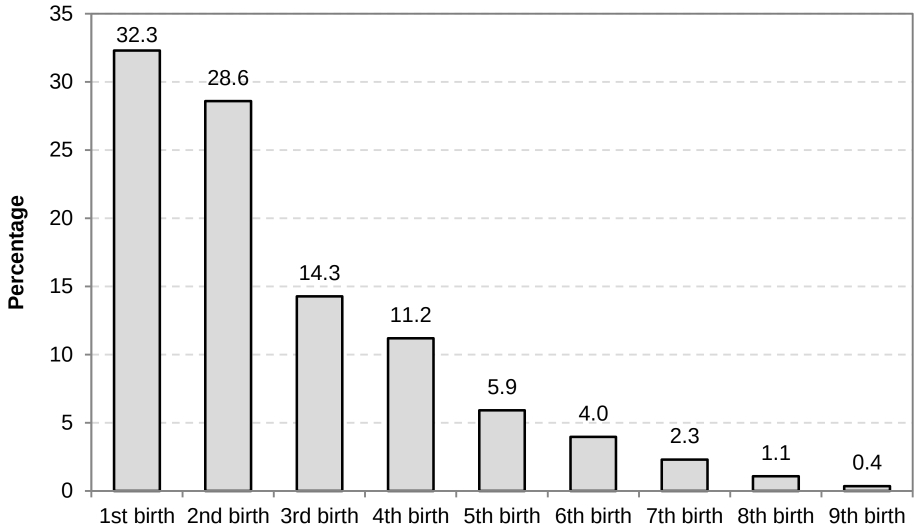
In order to investigate this in the case of Mongolia, the trend in the percentage of childless women age 45 and above was used as an indicator of (primary) infertility.[15] In the 1940s the percentage of childless women was on average more than 16%, but dropped to 13% during the 1950s, 9% in the 1960s, and 5% in the 1970s. Infertility was reduced by a quarter over 25−30 years. Thus a higher proportion of women were having children in Mongolia and contributing to the rise in fertility.

[13] If a mother is affected by syphilis but remains untreated, about 40% of foetuses will die in utero (Goldenberg et al. 2010).

[14] According to the calculations of Swedish nurses operating a clinic in Urga (nowadays Ulaanbaatar) in 1924, the whole population was affected by venereal diseases (Bawden 1968: 146). Bulag (2010: 207) reports that in 1950−1953 close to half of the Mongols living in pastoral areas in Inner Mongolia in China were affected by syphilis and that “[i]n some areas of Inner Mongolia, as much as 30 per cent of women with gonorrhea or syphilis became sterile, and 13 percent of pregnant women with gonorrhea or syphilis had miscarriages or stillbirths.”

[15] Primary infertility − the proportion of childless women − is distinguished from secondary fertility − the proportion of women who have already borne at least one child but are unable to have any more.

**Figure 4: Contribution (per cent) of the change at each parity in the fertility increase in Mongolia between 1933−37 and 1968−1972**




*Source*: Computed based on the 1989 Census sample available in IPUMS-International (Minnesota Population Center 2014).

The improvement in general health in Mongolia starting in the 1940s did not only reduce primary infertility (the proportion of childless women) but also led to a reduction in secondary infertility (the proportion of women who have already borne at least one child but are unable to have any more). The contribution of the decline in both primary and secondary infertility to the fertility increase can further be assessed through the use of parity progression ratios (PPRs). PPRs were computed from information in the 1989 census on the number of children ever born classified by the age of the mother. Implied average parities were computed by summing the product of PPR value and the parity reached. The contribution of the change in each PPR was assessed by holding the PPR value of a given parity constant at its mid-1930s value until the early 1970s. Between 1933−1937 and 1968−1972 a third (32.3%) of the fertility increase was due to the reduction in childlessness (Figure 4). The transition to a second birth contributed to a further 28% fertility increase. The transition to a third or fourth birth jointly contributed to around an additional quarter, whereas the transition to a fifth or higher-order birth added less than 14% to the fertility increase. The fertility increase in Mongolia is therefore a by-product of the reduction in both primary and secondary infertility, which is consistent with the development of the health system and the general increase in living standards throughout the country.

## 7. Discussion and conclusion

This study presents new empirical evidence on what happened to fertility in Mongolia during the first half of the $20^{th}$ century; a period for which little is known from a demographic point of view. Fertility remained fairly stable at 5 children per woman until the late 1940s, when it suddenly rose by about 2.5 children per woman to reach a peak at 7−7.5 children per woman from the 1960s to the mid-1970s, before beginning a continued decline that was later accelerated by the end of socialism in the early 1990s. The analysis also showed that the general improvement in health and living standards played a major role in explaining the pre-decline fertility rise in Mongolia.

To date, the Mongolian fertility change has been mostly interpreted in relation to government policies towards fertility (Gereltuya 2008). The high fertility levels of the 1960s until the mid-1970s have been understood as the result of the pro-natalist policies adopted by the socialist government, consisting in generous benefits to families having children. The onset of the fertility decline in the mid-1970s in Mongolia is explained by the changes made to these pro-natalist policies. While the policy factor has certainly contributed to explaining Mongolian fertility levels and trends, giving primacy to this factor is short-sighted, for a number of reasons.

Despite political concerns expressed after the First Five-Year Plan (1948−1952), strong pro-natalist provisions were only put in place with the launch of the Third Five-Year Plan in 1961 (1961−1965) (Neupert 1996; Gereltuya 2008). At that time the number of children per woman had already increased substantially and stood at about 2.5 children above its level 15 years earlier (Figure 1). The legal prohibition on the production, importation, distribution, and even the use of contraceptives, enacted in the late 1960s, the adoption of generous benefits to families having children, and the strict regulation of abortions and sterilizations could therefore explain, at most, the transient stagnation of fertility in the 1970s, and not the earlier fertility rise in the 1940s and 1950s.

Part of the reason why demographers have placed pro-natalist policies at the core of their interpretation of fertility change in Mongolia is that no official estimates of total fertility rates before 1963 are available. Therefore it was hard to conceive that the high fertility levels of the 1960s and 1970s were the peak of a pre-decline fertility rise originating in the late 1940s. The new fertility estimates presented in this paper put into perspective the fertility figures for the 1960s and 1970s and demonstrate that the causes of the high fertility levels recorded in Mongolia in the 1960s and 1970s are to be found in the dramatic societal changes the country experienced from the 1940s onwards (improvement in living standards and health, sedentarization, etc.).

Paradoxically, the period that witnessed the highest fertility levels corresponds to the collectivization and modernization of the Mongolian economy. Whereas it might be expected that the provision of basic services such as health and education as well as salary payments would result in early fertility decline, quite the opposite happened in Mongolia. The early stage of social and economic development contributed to increased fertility, mostly through health improvement and population settlement. The case of Mongolia is a situation where, through an improvement in health, women's childbearing potential was unleashed before social and economic change set in motion forces encouraging the adoption and spread of fertility control. Female education and labor participation were still low in the 1940s and 1950s, and it was only later, in the 1970s, that these factors began to negatively affect childbearing.

The contribution of the decline of sexually transmitted infections to explaining the pre-decline rise of fertility in Mongolia is very similar to that observed in several sub-Saharan African countries (Romaniuk 1967, 1980; Garenne 2008), and links fertility change to health factors. This evidence therefore reinstates the role of improved health conditions as an important determinant of the fertility transition (Cleland 2001; Reher and Sanz-Gimeno 2007). In Mongolia, however, the early improvement in health conditions and living standards not only contributed to the increased life expectancy of children − which certainly plays an important role in explaining the decline of fertility in the 1970s – but to reducing infertility and thus increasing the ability of women to bear more children.

The onset of fertility decline in Mongolia in the mid-1970s took place at a time of important development in the country. As analyzed by Gereltuya (2008), female labor participation and education increased, and abortion and IUD insertions were progressively legalized, though birth control was still strictly controlled and restricted to specific categories of women (Spoorenberg 2009: 145). In 1979, 90% of the female population was literate and more than a third had pursued at least some higher education. While each of these factors undoubtedly contributed to the onset of fertility decline in Mongolia in the 1970s, the decline in child mortality that preceded the fertility decline by about 25−30 years and the pre-decline fertility rise to very high levels as the result of a decline in sexually transmitted infections are certainly the main explanations of the onset of fertility decline.

The examination of historical fertility change in Mongolia indicates that major transformations − essential to the later decline in fertility − took place in the years before fertility reached the peak that usually precedes a continued fertility decline. Following Dyson and Murphy (1985: 432), the pre-decline fertility rise in Mongolia should therefore be considered as an integral component of the Mongolian fertility transition. This conclusion calls for demographers to examine the multiple changes occurring during this ‘opening phase’ of the fertility transition. An examination of the factors behind the pre-decline rise in fertility would allow demographers to better understand the causes and timing of the subsequent fertility declines (Dyson and Murphy 1985: 432).

To conclude, this analysis illustrates the importance of reconstructing long-term demographic changes in statistically less developed countries. Data similar to that used in this study are available in other countries and the methods that were used to estimate fertility could easily be applied to reconstruct the historical fertility change in those countries as well. Increasing the pool of experience of long-term fertility change would contribute not only to the better documentation of past population development in statistically less developed settings, but would also help to better understand the global process of the fertility transition, and ultimately increase our ability to understand future fertility trajectories.

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