# East is East, and West is West? Comparing Historical Infant Mortality Rates in Taiwan and the Netherlands

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## ABSTRACT

This article compares infant mortality rates in two historical populations: one in Europe (the city of Nijmegen) and the other in China (the city of Lugang). The author investigates whether the Malthusian divide — between a preventive demographic system in Western Europe and a positive system in Asia — can be substantiated. The conclusion is that the differences in infant mortality were not as large or as structural as often assumed. Furthermore, the expected negative impact of the patrilineal family system on girls in China could not be confirmed.

# 1    INTRODUCTION

Conclusions of scientific research are most intriguing when they challenge existing views. The reason for this is simple: whenever theories can be falsified, partly or fully, this opens up avenues for new insights. It is the eternal dialectical process that drives scholarly progress. I experienced this myself when studying the differences between Chinese and European demography in the past two centuries. According to traditional Malthusian ideas we were expected to find in China until the 1950s a system of young and almost universal marriage, and in Europe, that is west of the line Triëste–St. Petersburg, up to the Second World War a restrictive marriage pattern. John Hajnal and others found this to be true for western Europe, be it with some variations. The Chinese population, again in Malthus' view, had to pay a high price for universal marriage. Since this resulted in a large number of births, he predicted, nature would correct this reckless behavior with a red pen by way of positive checks, excess mortality (Malthus, 1798).

In the comparative project *Population and Society in Taiwan and the Netherlands* we took these notions as our point of departure. Since we had elaborate data on the individual level at our disposal we could test Malthusian predictions. To those who wondered whether these countries can be taken as representative examples of European and Chinese societies, we explained that, like in an analysis of variance, the differences within Europe and within Asia are much smaller than between Europe and China. There are case studies galore to show this.

Within the larger project, Hsieh Ying-hui and I chose to compare two cities in more detail, Nijmegen in the Netherlands and Lugang in Taiwan (Engelen & Hsieh, 2007). For Taiwan, the most reliable data are gathered by the Japanese authorities. Between 1895 and 1945 Japan occupied the island and kept extraordinary precise and elaborate registers of the population. Our period for comparison in Nijmegen was chosen carefully in such a way that the decor against which the demographic processes played was similar. We looked at the number of inhabitants, the economic structure, the phase in the demographic transition, and the shape of the age-distribution. By choosing for the years 1840 to 1890 in Nijmegen, we had two cities with comparable characteristics.

In this paper we focus on a striking characteristic of pre-industrial demography, infant mortality. By modern standards the chances of survival for newly born children in pre-modern societies were astonishingly low. Almost one quarter of infants did not reach their first birthday, and mortality remained high throughout childhood.

The high death rates of the very young highlight the economic conditions of life in the societies involved, the social differentiation within these societies, and the "deliberate" choices made by the historical actors. Since infant mortality is a reflection of general mortality, more precisely the mortality of the most vulnerable members of society, its level also permits us to assess whether Malthus' prediction on the prevalence of positive checks in Chinese society is valid. According to the classic division of the world in two parts, mortality should be significantly higher in our Taiwanese city than in Nijmegen.

Positive checks thus may show in a high level of mortality, but can also have a very deliberate form. Malthus already mentioned the "custom of exposing children". James Lee and his collaborators also emphasized infanticide as one of the ways in which Chinese couples consciously regulated the number of their offspring. In their view, the gender-differentiated character of infant mortality provides us with a strong indication of "proactive" behavior rather than of positive checks (Lee and Wang, 1999). For that reason, the comparison between Nijmegen and Lugang will deal explicitly with possible differences in infant mortality between girls and boys. Is there indeed a higher mortality among Lugang female babies than among male babies? And — since this custom does not have to be restricted to Chinese parents only — do we find evidence of gender differences in infant mortality in Nijmegen as well?

These then are the two questions we want to answer in this paper:

1.    Was infant mortality in Lugang indeed significantly and structurally higher than in Nijmegen?

2.    Were the chances of survival for baby girls in Lugang (and Nijmegen) significantly lower than for boys?

## 2    THE GENERAL LEVEL OF INFANT MORTALITY

In 19th century Europe, adult mortality stabilized or even slightly declined, but the chances of survival for the very young declined in the third quarter of the century. In Germany, France and Spain we find evidence of rising infant mortality between roughly 1840 and 1870. In his 1913 presidential address for the American Association for the Study and Prevention of Infant Mortality, L. Emmett Holt attributed the mid-19th century increase of infant mortality to the process of urbanization and industrialization. Densely populated cities and, especially, mothers working in factories proved fatal for many babies (Emmeth Holt, 1913). The link between women's work and infant mortality is breastfeeding, because all authors agree on the fact that the extent and duration of breastfeeding is the best predictor of infant mortality (Knodel, 1988). The Netherlands were no exception. Van Poppel and Mandemakers observed that for the country as a whole infant mortality increased markedly between 1840 and 1875 (van Poppel & Mandemakers, 1997).

What about Taiwan then? The Japanese colonial government not only compiled a large amount of high quality data between 1895 and 1945, but also heavily influenced mortality rates. The Governor-General soon found that more Japanese soldiers died in Taiwan of diseases than as a result of hostilities. In order to eliminate major epidemics and indigenous diseases on the island he launched large-scale programs to control major epidemics, to improve public health conditions, and to increase medical resources. The effects of these efforts show in a declining crude mortality rate of Taiwan from 30 per 1,000 inhabitants in 1906 to 16 per 1,000 in 1942 (Shi-yung, 2004).

Whether or not this general decline affected infant mortality has been recently assessed on the basis of data for 14 field sites across the island. Male infant mortality went from 223 in 1908 via 195 in 1925 to 130 in 1945, and the respective rates for women were 207, 136 and 130; an impressive decline. On the whole, the colonial period thus witnessed a general decline in infant mortality and a closing of the distance between male and female infant mortality (Yang & Hsieh, 2004).

The findings mentioned above guide our expectations for infant mortality in Lugang and Nijmegen. If the Dutch town lives up to the national average, the mortality among the very young will probably show a rise, whereas the probability of survival for babies in the Taiwanese town is expected to increase. We also wanted to know whether the rates developed in time. Therefore, we calculated in Nijmegen infant mortality by using the information on two periods (1850–1869 and 1870–1889). The Lugang infant mortality rates in the table start in 1920. This is because Barclay established an underregistration of births and deaths for the period before 1915. The same author also refers to three exceptional years of epidemic diseases. In 1915 the country suffered from an unusual high number of malaria deaths. The worldwide influenza outbreaks following World War I hit Taiwan in 1918 and 1920 (Barclay, 1954). Since we are interested in the long term development, we used information only from 1920 onwards, and divided the rest of the colonial period into 1922–1933 and 1934–1945. In the comparison both of level and development of IMR we refer in both cases to an earlier and a later period.

Table 1        *Infant Mortality Rates (IMR) in Nijmegen and Lugang*

|              | Nijmegen IMR | Lugang IMR |
| ------------ | ------------ | ---------- |
| Early period | 139          | 206        |
| Later period | 167          | 144        |
| *N births*   | *4,191*      | *3,898*    |

*Sources: Nijmegen civil registers and censuses; Lugang population database of the Program for Historical Demography, Academia Sinica.*

The change we find in Nijmegen follows the *general direction* we expected from existing research. In other words, the general rise of European IMR in the second half of the century is visible for Nijmegen residents too. By contrast, Lugang IMR declines dramatically from well above the Nijmegen level (206 versus 139) at the beginning of the periods compared here to a level below the Nijmegen value (144 versus 167). This allows us to deal with the prediction made by Thomas Malthus. He expected positive checks to be more active in China than in Europe. Since we have only two observations for Lugang, we have to be careful with our conclusions. Still, Malthusian penalties for unlimited female nuptiality seem indeed to have been the fate of Lugang in pre-Japanese times. The Japanese health measures started before 1920, so the IMR must have been higher at the start of the century, leaving us with a marked difference when compared to Nijmegen. We have to put this observation in proportion, however. First, the sharp decline between the two periods shows that a Chinese population could very quickly move to an IMR markedly below the average European level. On the other hand, a European population could reach a "Chinese" level of IMR at the same pace. The difference in other words, was not as structural and as marked as we expected.

## 3    DIFFERENT MORTALITY AMONG MALE AND FEMALE INFANTS?

In order to trace the existence of positive checks we also have to look for sex differences in infant mortality in our two towns, because both Malthus, in 1798, and Lee and Wang, in 1999, referred to infanticide as one of the options for Chinese parents for controlling the number of their offspring. Given the importance of sons under patriliny this method would be applied more often to girls than to boys. The topic is very complicated however. First of all, biology favors survival chances for girls. When mortality rates for boy and girl infants are the same, this implies that sons get preferential treatment. Only a higher female infant mortality rate points almost certainly at gender specific treatment of infants. Also, from the demographic measures one cannot learn what exactly happened. A society could use direct infanticide, preferential neglect, differences in age of weaning, or a combination of all these measures.

The literature on this subject is biased in suggesting that direct or indirect infanticide is a Chinese or Asian predilection. Still, when comparing a European and a Chinese population, one has to be aware of son preference in European societies too. Isabelle Devos, for instance, found that mortality of girls in 19th century Belgium was 15 to 20% higher than mortality of boys, especially for childhood and adolescent mortality. Devos claimed that her findings were representative of most Western European countries (Devos, 2000). There is evidence, however, that a higher probability of dying for girls is not a universal European phenomenon. Knodel, for instance, did not find evidence for preferential treatment of sons in his 14 German villages (Knodel, 1988). More recently, a comparative survey concluded that Europe indeed had its "missing girls" too, be it especially in East and South Europe (Beltrán Tapia & Szołtysek, 2022).

Table 2a        *IMR, neonatal, and postneonatal mortality Nijmegen*

|  | IMR | | neonatal | | postneonatal | |
|---|---|---|---|---|---|---|
|  | M | F | M | F | M | F |
| **Early period** | 145 | 133 | 38 | 29 | 111 | 107 |
| **Later period** | 190 | 142 | 44 | 27 | 153 | 118 |

Table 2b        *IMR, neonatal, and postneonatal mortality Lugang*

|  | IMR | | neonatal | | postneonatal | |
|---|---|---|---|---|---|---|
|  | M | F | M | F | M | F |
| **Early period** | 222 | 188 | 137 | 105 | 99 | 92 |
| **Later period** | 155 | 133 | 83 | 57 | 78 | 80 |

*Sources: Nijmegen civil registers and censuses; Lugang population database of the Program for Historical Demography, Academia Sinica.*

In both cities average infant mortality among boys is higher than among girls. More precisely, male infant mortality exceeds female infant mortality in Nijmegen by 13% and in Lugang by 18%. When we divide infant mortality into neonatal and post-neonatal mortality the conclusion for Nijmegen remains the same. Also, the development between our two periods points in the same direction, although less unequivocally. The Lugang data tell a different story. Assuming that neonatal mortality is caused mainly by endogenous factors, we find the expected result. Male neonatal mortality is higher and even rises between the two periods. In post-neonatal mortality, on the other hand, we find evidence for preferential treatment of sons. Even in the first period the differences between male and female mortality are only marginal. More significant is the finding that between 1933 and 1945 female post-neonatal mortality was 5% higher, which runs contrary to the biological advantage girls had over boys. The interpretation could be that at this point son preference shows itself. Interestingly, though, this is not the case for neonatal mortality in the two periods, and it also does not appear for post-neonatal mortality in the first period. These calculations therefore provide no evidence for a specific Chinese form of "proactive" behavior, namely infanticide, the less so since we also find relatively high female infant mortality in Nijmegen during the earlier period.

# 4 CONCLUSION

When we measure positive checks through infant mortality, the difference between Nijmegen and Lugang was not that great with an 85% survival chance for Nijmegen babies against 83% in Lugang. During the period covered here, infant mortality in Nijmegen increased from 139 to 167 — an increase found in many European countries — whereas the medical policy of the Japanese colonial government in Taiwan resulted in a declining infant mortality, from 206 to 144. This shows that the difference between our Chinese and European populations was neither as structural nor as marked as one would expect from the Malthusian model.

We do find a marked difference between Nijmegen and Lugang when we compare the levels of neonatal and post-neonatal mortality. Neonatal mortality in the Dutch town was stable or slightly declining — again, as was the case in most European countries — while neonatal mortality in Lugang was double the Nijmegen level. The sharp increase in Nijmegen infant mortality was therefore completely driven by post-neonatal mortality. We deduce from these findings that delivery and taking care of newly born babies in the Netherlands was arranged better than in Taiwan. The increase in post-neonatal mortality on the other hand proves that the economic conditions in Nijmegen deteriorated in the 19th century. In the colonial period, the opposite was true for Taiwan.

The most surprising result from our multivariate analysis is the predominance of biological factors when explaining infant mortality (Engelen & Hsieh, 2007). Although social class in a descriptive presentation seems to influence the level of infant mortality, this association disappears when we control for other variables. The only class effect that remains is found for neonatal mortality in Nijmegen. Obviously, the richer the parents, the better medical care they could hire for the delivery and the immediate aftermath. For the remainder we only find that in both cities chances of dying for infants are influenced by being a twin and by small birth intervals. Interestingly, the sex differences in infant mortality do not follow the path shown by Malthus or Lee. Male babies died more often than female babies, and we therefore have no evidence of female infanticide.

One final remark: the Taiwan case cannot simply be taken as exemplary for China. Although many characteristics of the Taiwanese society were typically Chinese, the Japanese occupation transformed Taiwan into a more modern version of the regions on the mainland.

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