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Quantitative analysis of epidemic and population patterns in the Chinese Empire: how is this possible?

To the Editor

Based on two sets of data, Professor Morabia reveals that demographic expansion closely matches the increasing number of outbreaks and epidemics [1]. The burden of epidemic diseases seemed to grow at the same rate as the population enumeration throughout the Chinese Empire. One set of data is the list of epidemics in China, provided by Joseph Cha, in William McNeill's well-known work *Plagues and Peoples*. Another is population data collected by J. D. Durand.

One question that comes to mind is: are the two sets of data reliable? Professor Morabia admits that both data sources are affected by serious biases, but he believes that the sources are still valuable for illustrating the general form of long-term trends. Why were the data used if it is clear that the figures are inaccurate?

First, since electronic databases are becoming more and more popular, many Chinese historical documents can be found on the Internet. Thus, it is really not difficult to improve and modify the list of epidemics [2, 3]. Second, Professor Morabia ignores many important articles related to this topic, both in Chinese and in English [4–8]. Third, war and climate were also major factors affecting the emergence of epidemics in Chinese history [7]. Further, quantitative analysis may connect these data with factors including war frequency, season distribution, climate change and urbanization epidemics.

The number of Chinese documents has grown continuously since the Song dynasty so that more outbreaks may have been documented. In the history of China, disease always accompanied war and natural disasters. Moreover, it was also tied closely to population density and the development of transport. The figures used by Professor Morabia do not take these factors into consideration.

Even though the explanations for using the data are acceptable, many questions remain. I will mention three here: (1) Professor Morabia only considers the frequency of disease outbreaks, but he does not refer to the incidence of disease, the duration or the number of deaths. Since there are some connections between disease outbreak and population size, the relationships between population size, population density and disease intensity should be discussed. (2) In ancient times, population density was highest in the capital. Therefore, the conditions of diseases in the capital and other major cities should be discussed in order to fully support Professor Morabia's conclusions. This would more convincingly show the relationships between population concentration, density, and diseases, than basing the analysis on provincial divisions and the south–north division of China. (3) Professor Morabia discusses the relationship between disease and population solely with respect to the increase in population. In fact, population mobility, such as migration and military movement due to war, also plays an important role in disease outbreaks, spread and diffusion [9, 10].

Declaration of Interest

None.

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The author replies:

I thank Professor Fan for reacting to my paper about the evolution of epidemics and population in the Chinese Empire and bringing to my attention related articles.

Professor Fan wonders why I analysed a dataset of questionable accuracy, why I did not provide more detail about the specific diseases involved, and why I did not try to relate the trends to climatic, social or military determinants beyond demographic growth. I must first stress that my objective was to use the Chinese catalogue of epidemic data to shed new light on the evolution of epidemic diseases over 2000 years in an agrarian society. The material had not yet been untapped for this purpose. The consistency of the epidemic and demographic data suggests that the trends might be meaningful even if the absolute numbers are not. I did not pretend to study specific diseases or provide an explanation for the trends. Furthermore, I did not seek to study the, 'incidence of disease, the duration and the number of deaths' because I am not aware that such data are available for the whole imperial epoch or even a substantial portion of it.

I did not find in Professor Fan's letter new material which helped me expand upon what was already in my article. Twitchett uses the same list of epidemics for the T'ang dynasty (618–907) that I use [1]. Dunstan's brilliant undergraduate thesis focuses on five northeastern provinces between 1580 and 1640 [2]. Incidentally, the thesis was published in *Ch'ing-shih wen-t'I*, a journal about issues in the history of the Qing dynasty, and not in *Ming Studies*. To integrate her data in a larger perspective would require applying a similar analysis of local gazetteer information for the whole imperial period, or at least some provinces. Leung discusses the evolution of specific diseases in premodern China but does not cover trends in intensity [3]. The review by Fan *et al*. is instructive for non-Chinese-speaking scholars, but does not reveal new information with respect to the trends in epidemics [4]. Stannard's discussion of human migration and disease is not directly relevant to the topic [5].

Interestingly, in their analysis of climate change, war, and populations, Zhang *et al*. observed two major peaks in wars and rebellion, in the 14th and in the 17th centuries [6]. These peaks mirror the two demographic troughs on my figure 2, about which I wrote: 'major population losses may have occurred following the Mongol and Manchu conquests, due to warfare and subsequent destruction of the economy, but not necessarily due to epidemic diseases'. This is an additional source of consistency between my analysis and a third source of historical data, beyond epidemic and population.

I was most intrigued by Professor Fan's statement that 'it is really not difficult to improve and modify the list of epidemics'. This is in sharp contrast to what other Chinese scholars have told me and to Dunstan's feeling when she wrote 35 years ago that the collection of incidental references scattered in gazetteers and compilations 'would demand a very lengthy full-time combing of a vast number of sources' [2].

I do not have the skills needed to consult the work in Chinese by Zhang entitled, *Three Thousand Years of Epidemics* or the Scripta Sinica or CHANT (Chinese Ancient Texts) databases cited by Professor Fan. But if much more evidence about epidemics is available in these documents and databases, I am extremely surprised that they have not been more thoroughly exploited. Exploring these sources is likely to tremendously enrich our understanding of how epidemics have affected everyday life in agrarian societies across several millennia. Which young historian could resist salvaging this fabulous treasure?

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