Exposure to Infectious Disease in Modern Japan:
A Case Study. The Typhus Epidemic of 1914

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The central focus of the ‘health transition’ debate has been on how infectious diseases declined in modern societies. Yet scholars have not reached an agreement over its causes. Whereas some look at people’s increasing resistance to exposure to disease (e.g. a rise of nutritional status), others place more emphasis on the increasing protection from exposure (e.g. public health measures). Either case though, ‘exposure to disease’ is a central concern. In the recent debates over the biological standard of living, too, ‘exposure to disease’ has been regarded important as a variable which might have affected the nutritional status of the population. There have been active, sophisticated debates over the possibility that an infection with certain diseases during their growth period might have reduced their anthropometric status thereafter.

Thus, in order to develop discussions over health transition and the living standards in modern Japan, a detailed examination of ‘exposure to disease’ should be essential. Yet historical epidemiology has been a relatively neglected field of research in Japan. We are on the process of accumulating case studies on individual diseases. This paper deals with typhus. Who were exposed to the disease? When were they exposed and where? The paper focuses especially on the 1914 epidemic.

Typhus is a louse-borne rickettsial disease. It is often associated with famines and wars, which can cause conditions of misery and poor hygiene (Harden 1993). At first sight of Figure 1, the incidence of typhus in Japan during the first half of the 20th century seems to accord with one of these associations. There were two outstanding outbreaks: one was in 1914, the year that witnessed the outbreak of the First World War, and another in 1946 when Japan was in the muddle right after the Second World War.

The latter was indeed related to hardships and poor hygiene due to war conditions. Though official disease returns in war years (1941-45) were not too reliable, it can be noticed that the incidence of typhus became noticeable during war years and blew up in 1946. Under war and post-war conditions, not only soldiers but also many civilians were forced to live in filthy conditions. Deterioration of living conditions, shortage of goods and services, especially health provision, and extraordinary movements of people such as mobilization, demobilization, go and return from evacuation, enhanced the risk of diffusion. The epidemic of 1946 is often
recalled as a symbolic feature of post-war turmoil, with the memory of DDT dispersed vigorously by the Allied Forces (Tokyo Prefecture 1954).

On the other hand, the former in the opening year of the First World War was only coincidental. The epidemic, in the first place, started earlier than the outbreak of war. It is well-known that, during the First World War, typhus spread first among military forces and then to civilian populations explosively, especially in Eastern Europe and Russia (Zinsser 1935; Patterson 1993). In contrast, though the Japanese Army confronted Germans in China, the living of civilians in Japan was almost unaffected by the First World War. So, if not war conditions, what were the grounds for the typhus epidemic of 1914? Although its scale (7,309 cases in total) was not so large as that of 1946 (32,366 cases), it seems rather an abrupt outbreak and it is interesting to explore factors that promoted it in this particular timing.

**Diagnosis**

The first typhus case of the 1914 epidemic was recorded in Tokyo. From mid February of that year, enigmatic fever cases occurred in succession in common lodging houses and temporary shelters for casual labourers in the downtown areas of Tokyo. Its characteristic symptoms included high fever and rushes. Sanitary officials at first suspected typhoid fever, but bacteriological examinations (Widal tests, to identify typhoid) indicated negative. They eventually reached a guess, by elimination of other possibilities, that it might be typhus. Since the causative agent of typhus had not yet been identified at that time, they did not have means to assuring it with a bacteriological certainty. On March 16, Dr Hajime Miyamoto, director of the Komagome Hospital (Tokyo’s municipal hospital for infectious disease), made a decision on the basis of clinical observations and officially announced that the enigmatic disease in Tokyo should be typhus (The Sanitary Bureau 1916: 80-81; Komagome Hospital 1983: 282).

Despite the similarity in names, and in symptoms to some extent, typhus and typhoid are different diseases. It was in the 1830s that they came to be recognized different diseases in Europe and America. In the English ‘causes of death’ statistics, the two diseases had not been distinguished until the late 1860s (Hardy 1993a: 152). The discovery of the typhoid bacillus was in 1883 by the German bacteriologist Georg Gaffky, followed by the invention of a diagnostic method of typhoid by G.W.F. Widal in 1896. But the invention did not necessarily mean that Widal tests were employed for every case thereafter. And the method had its limits. Confusion between the two diseases did not disappear soon. It was in 1916 that, following the important work done by Howard Ricketts in 1910, Rocha Lima finally succeeded in identifying the causative agent of typhus, *Rickettsia prowazki*.\(^1\)

While typhoid tended to be endemic, typhus epidemics were often more intermittent. In Japan, typhus, together with other chief acute infections, was made a compulsorily notifiable disease in 1880. According to official statistics thereafter, there was an epidemic period of typhus in Japan until the early 1890s: the outbreak in 1886 is particularly noticeable. The annual number of cases then decreased to less than one hundred in 1896. No patients were recorded at all in 1913, a year before the sudden resurgence. It seems that typhus had almost become a ‘forgotten disease’ in Japan by the early 1910s. This was one of the reasons why sanitary officials took time to reach the conclusion that the enigmatic fever was typhus in 1914. Of course, though, official statistics did not necessarily reflect the ‘real’ incidence. There is a

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1 The epidemic in Japan was two years earlier. But the Japanese public health authorities were aware of Charles Nicolle’s discovery in 1909 that the body louse was the vector of typhus. Although without the knowledge of the causative agent, they therefore were able to carry out vector-targeted preventive measures such as disinfection (Sanitary Bureau 1916: 190).
possibility of wrong diagnosis, and then of underreporting. Many might have been confused with typhoid or other diseases. It is not surprising that occasional, less common typhus cases were misdiagnosed, or even unnoticed, especially in its non-epidemic periods.

The enigmatic fever cases found in February and March 1914 and thus acknowledged as typhus after March 16 concentrated in Tokyo (Figure 2). From April, notifications of typhus cases suddenly became frequent also in the provinces. By this time, the disease seems to have diffused widely accompanying the flows of people from the capital city. In addition, we should consider another possibility that ‘enigmatic’ fever cases had existed also in the provinces but been unnoticed or misdiagnosed. Following Tokyo’s judgement of March 16, provincial doctors and sanitary officials came to diagnose them properly as typhus. Although the first case of 1914 was officially recorded in Tokyo, the epidemic might actually have started elsewhere earlier.

**Typhus before 1914**

In March 1914, Joji Ishihara, a local medical practitioner in the Yamagata Prefecture, visited the Komagome Hospital in Tokyo to see patients suffering from the enigmatic fever. After the visit, Dr. Ishihara became confident that the enigmatic fever in Tokyo was the same disease that he had seen in his locality for years. According to Dr. Ishihara’s report, unknown spotted fever had sometimes been seen in the Shonai district of the Yamagata Prefecture since the late 1890s. There was an outbreak in 1901, when the number of patients amounted to 117. Since then, the fever was observed every two or three years, normally in spring months. 41 cases were recorded in 1913, a year before the typhus epidemic of 1914 (Table 1). Some cases were notified as ‘typhoid’ and the rest was left outside official notification. But now Dr Ishihara became convinced that they should have been ‘typhus’ (Ishihara 1914).

As has been mentioned above, typhus cases were sporadic in Japan after the late 1890s on official statistics. Yet even during that non-epidemic period (Figure 3), the Yamagata prefecture in particular tended to record a larger number of typhus cases than other prefectures. In 1902 and 04, for instance, more than 90% of the total number of typhus cases in Japan were recorded in Yamagata. If we think of the spotted fever in Dr Ishihara’s report as typhus, the incidence of the disease seems almost continuous in Yamagata during the non-epidemic period. There were years when neither official typhus nor Ishihara’s spotted fever cases were recorded. But modern epidemiology tells that typhus can be mild on children under 15 years of age. It is likely that unrecognized cases, especially among children, served to maintain the disease during those years (Hardy 1993a: 198; Harden 2003: 353).

Similar, retrospective recognitions of typhus were made also in other prefectures. In the Aomori Prefecture, a large portion of ‘typhoid’ cases in 1908 to 13, which had failed to react to Widal tests, became now suspected as typhus (The Sanitary Bureau 1916: 359). In Hokkaido, sanitary officials came to point out that a number of typhus cases might have been included among the cases which had been reported as ‘relapsing fever’, another louse-borne disease, in 1911 (Ibid: 336-338). Of these prefectures, Yamagata and Aomori are in the North-east region, and Hokkaido is an island in further north. It is not surprising that the disease persisted in these snowy regions, since typhus is known as a disease of cold climates. The snowy winter could foster lousy conditions due to bad ventilation, poor lighting and the circumstances under which people were obliged to wear the same clothes made of cotton for days at a time (The Sanitary Bureau 1916: 83; Harden 2003: 352).

These pieces of retrospective evidence suggest that the typhus pathogen had been scattered in the North-east region prior to the 1914 epidemic. Figure 4 shows the number of typhus cases in prefectures in 1914. It is noticeable that cases concentrated in the eastern half of
the country. Apart from Tokyo and neighbouring prefectures, the prefectures in the North-east region recorded a large number of cases. While the full-blown epidemic across the North-east region started in April 1914 due to the ‘re-exported’ pathogen from Tokyo, it is reasonable to think that the epidemic originated in somewhere in the North-east region, and was brought to Tokyo.

**Sufferers in 1914**

Why then did the sporadic, localized incidences of the disease develop into an explosive outbreak in 1914? In order to have clues to the question, let us first look at who suffered and where during the 1914 epidemic.

Who were the victims? Figure 5 shows the percentage of typhus cases classified by age-group in twelve prefectures whose total number of cases amounted to more than 100 in 1914. Of the twelve prefectures, six were in the North-east region (indicated with NE on the Figure), one in the North (= Hokkaido, indicated with N), and five from the Kanto region (Tokyo and neighbouring prefectures). The distribution between age-groups in prefectures is seemingly rather random. Yet it can be pointed out some regional contrasts. While the percentage of children and teenagers tends to be high in North-eastern prefectures, adults, especially those in the midst of their working age (20s-40s) account for a larger portion in Kanto prefectures.

Contrasts between regions are seen with regard also to the male/female ratio of patients (Figure 6). It is noticeable that male patients outnumbered females in the Kanto region. In the Tokyo metropolitan prefecture, 73.0% were male, followed by Kanagawa 64.9%, Gunma 61.2%, and Saitama 58.0%. On the other hand, the ratio was almost even or slightly on the female side in the North-eastern prefectures, ranging from Aomori’s 51.6% to Yamagata’s 45.6%. As far as the North-eastern prefectures are concerned, it is difficult to point out specific age- and gender- groups that were particularly exposed to typhus. In Tokyo and surrounding prefectures, meanwhile, males in their working-age appear to have been most typical of typhus patients in 1914.

Figure 7 shows where cases broke out in each prefecture during the 1914 epidemic. In the North-eastern prefectures, most patients were found in their own houses. In Tokyo and neighbouring prefectures, in contrast, a higher percentage of patients were found in ‘common lodging houses and lodging houses’ and ‘miners or construction labourers’ lodges’. These two items account for nearly 40% of the cases in the Saitama, Tokyo, and Kanagawa prefectures. This clarifies the typical victim image in the Kanto region further: male adults, most of whom were supposed to be casual labourers staying in temporary accommodations and occasionally wandering for temporary employments. The larger share by those ‘unsettled’ victims in Kanto seems remarkable in comparison with the North-eastern prefectures where the majority of victims showed the symptoms while ‘settled’ in their homes.

Miserable living conditions in common lodging houses (*kichin-yado*) for ‘un-settled’ workers had attracted concerns of social investigators. Gennosuke Yokoyama, for example, in his famous report in 1898, sighed over unhygienic conditions in common lodging houses in Tokyo, in which lodgers were used to living with ‘numerous plant lice’ (Yokoyama, 1949: 56). It was not surprising that their dirty environment, bad ventilation, and overcrowding, providing favourable conditions for the diffusion of typhus. They fitted well in the ‘fever-nest’ image, which promoted reactions from those living outside, of fear, contempt and desire for tighter
regulations and reforms. As has been mentioned earlier, the first notified case was actually found in a common lodging house in the downtown Tokyo. By that time, the disease seems to have already been prevalent in neighbouring areas. The first notified was therefore not necessarily the very first case in Tokyo. A difficulty for sanitary officials was the unsettled nature of lodgers: it was hard to identify the exact locations of infection and therefore the routes of diffusion. The official report by the Sanitary Bureau, the central government department in charge of infectious disease control, could only point out the possibility that the pathogen might somehow be imported to Tokyo by workers from the North-east region. (The Sanitary Bureau 1916: 85, 212). It is not possible also for us to trace the exact route of infection. Yet, we now have a useful hint which links the sporadic, localized incidences of typhus and the outbreak in Tokyo: mobility of labourers.

Labour mobility

Tokyo was a centre of the casual labour market. The Tokyo City defined ‘casual labourers (jiyu-rodo-sha)’ as workers roaming for unskilled, temporary employments (Tokyo City 1923a: 3). Staying normally in common lodging houses and temporary shelters provided by public or voluntary agencies, they looked for jobs, many of which were temporary ones offered through private or public job agencies. Those who got jobs with boarding lodges could move to accommodations provided by employers. Major jobs open to casual labourers in Tokyo included those in civil engineering projects (roads, railways, waterworks etc.), on private building sites, porter works (e.g. at ports and markets), and those related to sanitation (waste removal, cleaning of streets and public toilets etc.) (Ibid: 27-37). The range of jobs listed here reflected Tokyo’s rapid rise as the country’s capital.

Where did those labourers come from? According to a sample survey (of 1,300 labourers) in 1923, nearly a half of them were from the Kanto region (Tokyo and its neighbouring prefectures), followed by a quarter from the Central (Chubu) region. The North-east and Hokkaido accounted for 11% in this survey (Ibid: 181-182). The North-east was a predominantly agrarian region. But a surplus of population in relation to land enhanced the pressure for emigration to industrial, urban areas. Some researches have shown that an increase of emigration from the North-eastern prefectures to outside was becoming remarkable from around 1910 (Shimizu 1981: 79; Matsuda 1985: 2). It is possible to think that the emigrants who moved in early 1914 included those from places where the typhus pathogen was latent, and that they brought the pathogen to Tokyo.

This possibility is not totally deniable yet open to further consideration. Emigrants can be divided into two categories: permanent and temporary. The emigrants from the North-east to Tokyo around the 1910s consisted mainly of those who envisaged permanent settlement. In the

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2 This is noticeable especially in the tone of newspaper reports. See e.g. Yomiuri Shimbun, April 25, 1914: 2. For an account of the ‘fever-nest’ image in relation to typhus in London, see Hardy 1993a: 193. For a general account of urban slums in modern Japan, see also Chubachi and Taira 1976.

3 It is notoriously difficult to grasp labour mobility in the pre-WWI years, due to the absence of data. This is more so regarding that of casual labourers than of formal, factory labourers. Here we use the investigations conducted by the Tokyo City authority in the early 1920s. Since Japan experienced a remarkable economic boom during the WWI years which exerted some influence over the labour market, it is not quite favourable to see pre-war years based on evidence in the 1920s. But it is presumed that the trends and patterns picked up here were continuous from before the war-time boom.

4 The item ‘miners, construction labourers’ lodges (kofu/doko beya)’ in Figure 7 stands for such accommodations.

5 While envisaging a ‘permanent stay’, many of them were obliged to live in Tokyo as casual labourers without a
meantime, there were many temporary emigrants as well. They were mostly workers in the agricultural sector who looked for seasonal labour in other sectors only during winter months (called *dekasegi* in Japanese). But those seasonal *dekasegi* workers tended to move within the region or to head for Hokkaido, and few went as far as Tokyo. Therefore, the current of migration between the North-east and Tokyo was rather one-sidedly from the former to the latter (Shimizu 1981:94). If so, a question arises: who brought the disease back to the North-east region? As we have seen earlier, typhus had existed in some places in the region from before the outbreak in Tokyo. But it was after the outbreak in Tokyo that the disease spread all over the North-east region. It can be thought that the disease was re-exported from Tokyo and then diffused over wider areas in the region, including places which had been free from the disease before. The question is by whom and how.

Let us turn again to the casual labour market in Tokyo. Earlier, we have listed major jobs in which casual labourers were engaged in Tokyo. It should be noted however that the demand was not always sufficient for the supply within the metropolis. To supplement this was the demand from provinces. There were private agencies which acted as intermediary between casual labourers in Tokyo and provincial enterprises which demanded them (Tokyo City 1923a: 94-96). Apart from the prefectures surrounding Tokyo, chief destinations were Hokkaido and North-eastern prefectures.

Hokkaido was a northern frontier, whose development started virtually after the Meiji restoration (1867). Since the late nineteenth century, the construction of social infrastructure, such as roads, railways, irrigations, and embankments, had been rapidly under way. The demand of labour for such works could not be filled by the people settled in the island, and attracted casual labourers from the main island, many of whom had been recruited in Tokyo (Tokyo City 1923b: 3-11, 44). It seems plausible that typhus was brought by such workers from Tokyo. The official report on the 1914 typhus epidemic mentioned several cases in which construction labourers recruited in Tokyo showed the symptoms after arriving in Hokkaido (Sanitary Bureau 1916: 330).

In the North-eastern prefectures, railway construction was a chief sector which involved casual labourers. The development of railways in the North-east started in the late 1880s from the Fukushima Prefecture, the south of the region. In the mid 1890s, the development was initiated also in the Aomori Prefecture, the northern edge. It was in 1905 that the Ohu-line, the main line going through Fukushima to Aomori via Yamagata, was completed. The construction of local lines followed (Noda et. al 1986). Thus, railway-related undertakings in the North-east region attracted a certain number of casual labourers from Tokyo, although its volume was not so large as in Hokkaido. Among the North-eastern prefectures, Fukushima seems to have attracted a larger number of workers from Tokyo, since the building of large-scale hydroelectric power stations were also in progress there (Tokyo Denryoku 2002: 209; Tokyo City 1923b: 56).

Thus, it is likely that typhus was re-exported to the North-east region by casual labourers from Tokyo. Yet this is not the end of the story. Remember that the disease spread mainly among people living in ‘ordinary houses’ (as opposed to temporary lodges such as ‘common lodging houses’ and ‘miners, construction labourers’ lodges’) in the North-east (*Figure 7*). Casual labourers stayed usually in common lodging houses or accommodations

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6 *permanent employment*.

6 Notably, the construction of the local line connecting the Shonai area (where Dr Ishihara was from) with the Ohu-mainline was under way in 1913-14.
provided by employers, and not in 'ordinary' houses. We need to think by whom the disease was brought in ordinary households. Likely suspects have already appeared earlier in this section: seasonal dekasegi labourers.

Dekasegi (off-season labour by agricultural workers in other sectors) had been a common practice since the early modern period. In the earlier periods, the majority of dekasegi labourers moved within their prefectures. But, by the early 20th century, a number of dekasegi labourers who looked for temporary employments in other prefectures had increased. While, as has been mentioned, few went as far as Tokyo beyond the regional boundaries, many headed for Hokkaido (Shimizu 1981: 57, 89; Kuwabara 1982: 108-111). Thus, the dekasegi labour market overlapped with the Tokyo-centred casual labour market. Dekasegi labourers were likely to meet casual labourers from Tokyo on construction sites or in temporary lodges across Hokkaido and the North-east region. Dekasegi workers usually returned home in early spring for a new agricultural season. It would be reasonable to think that some who thus went back home in the spring of 1914 were with typhus contracted at the dekasegi sites. It is interesting that, with regard to the ratio of cases found in temporary lodges (Figure 7), Fukushima and Hokkaido stand in the middle between the Kanto prefectures and other North-eastern prefectures. This seems to reflect that these two prefectures had many sites where encounter between dekasegi and Tokyo-based workers took place.

These places, in the first place, might have mediated the diffusion from the North-east to Tokyo prior to the outbreak in Tokyo. In the North-east region during the autumn to winter months, dekasegi was more frequent than emigration to Tokyo. It is therefore more plausible that the disease was carried from the areas of stealth endemicity at first by dekasegi workers to their working sites and, there, conveyed to other workers going back to Tokyo, than the possibility that it was brought directly to Tokyo by emigrants from those areas.

There was a particular factor which increased the number of dekasegi labourers in the winter of 1913-14: the bad harvest which affected all over the North-east region. Due to the cold weather during the summer months, the harvest of rice decreased by 36% in 1913 in the region as whole (Yamagata Prefecture 1984: 655). This put great pressure on the regional economy and, in particular, households in the agricultural sector. Many were obliged to go out as dekasegi labourers in order to sustain their lives. Although it is difficult to present quantitative evidence, there was a temporary increase of mobility in the winter of 1913-14. This certainly enhanced the risk of typhus coming out of its lurking places. We can see here a plausible answer to the question why the sporadic, localized incidences of the disease develop into an explosive outbreak in February 1914.

Conclusion

It is tempting to conclude, following the classic ways of association, that the 1914 typhus epidemic was not related to war conditions but related to a ‘famine’, in view of the bad harvest of the previous year, though it did not actually develop into a famine. It certainly caused economic distress and the deterioration of living conditions, which might have enhanced the risk of infection among the people in the North-east region, where the typhus pathogen was thought to have survived sporadically during the inter-epidemic period prior to 1914. But, of course, the deterioration of livings alone did not cause the explosive outbreak. What we have focussed on in this paper is not the bad harvest itself but an increase of social dislocation after that.7

In the early 20th century, the North-east was no longer a remote, simply agricultural

7 For a suggestive account of typhus as a disease of social dislocation, see Hardy 1993b: esp. 209-212.
economy. We should draw attention to the increasing integration of its economy with other regions, especially Hokkaido and Kanto (including Tokyo). The rise of industries and the building of social infrastructure like railways in Hokkaido and the North-east region demanded casual labour. This provided households in the North-east a wider range of opportunities for subsidiary incomes from *dekasegi* labour. At the destinations of *dekasegi*, the North-eastern workers met and stayed together with workers from other regions, many of whom were Tokyo-based. Thus, inhabitants in the North-east region were in a link with those in Tokyo through the medium of the *dekasegi* labour market and the Tokyo-centred casual labour market. This was to entail the risk of transmission of typhus from its hiding places in the North-east to Tokyo. It can be thought that the risk got real when the harvest failure in 1913 pressed an extraordinary number of people in the North-east to go for *dekasegi*. The function of Tokyo as a ‘hub’ of diffusion was powerful. Tokyo was the busiest centre of comings and goings of people and goods in the country. The sneaking arrival of the disease, which had almost been a forgotten one, in the metropolis provided decisive momentum to an explosive outbreak in the spring of 1914.

References


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---------- (1923b) *Chiho Nimpu-beya ni kansuru Chosa* (A report on the conditions of accommodations for casual labourers in the provinces)


*Yomiuri Shimbun* (newspaper)


### Table 1

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Figure 1A  Typhus cases in Japan

Figure 1B  Typhus cases in Japan (Log scale)

Source: Sanitary Bureau, Annual Reports
Figure 2

Typhus cases in 1914, by month

Source: Sanitary Bureau (1916)

Figure 3

Typhus cases: Japan, non-epidemic period 1897-1912

Source: Sanitary Bureau, Annual Reports
Figure 4 Typhus cases, 1914, by prefectures

Source: Sanitary Bureau (1916)

Figure 5 Typhus cases in 1914, by age-groups (%)

Source: Sanitary Bureau (1916)
Figure 6. Typhus cases in 1914, by gender

[Bar chart showing typhus cases in 1914, by gender and region.]

Source: Sanitary Bureau (1916)

Figure 7. Where typhus cases broke out? (1914)

[Bar chart showing the distribution of typhus cases by location and type of accommodation.]

Source: Sanitary Bureau (1916)