Bubonic plague in south Bihar: Gaya and Shahabad districts, 1900–1924

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Introduction

Bubonic plague was perhaps the most puzzling and dreaded disease in the western world till the twentieth century. This was both on account of its heavy toll—till the advent of modern sulpha drugs 70–80 per cent of those who contracted the disease died[1]—and the mysterious way by which it seemed to spread. There seemed to be something supernatural about a disease that could not be contained by normal quarantine measures. Indeed, such measures seemed to aggravate the epidemic, for it did not pass directly from the diseased to those who cared for the patients.

It is somewhat chilling to note that a disease (primarily of rodents) which only incidentally effects humans, should have claimed more human victims in the course of three devastating pandemics of 541–767 A.D., 1346–1771 and 1850–1930, than all the wars ever fought. It is estimated that more than 200 million people perished in these pandemics.[2]

The plague spawned a horrifying folklore in Europe, some of which has been passed on in such innocuous phrases as 'God bless you', in response to a sneeze, and the cheerful nursery rhyme,

[1] Andrew B. Appleby, 'The Disappearance of the Plague: A Continuing Puzzle', *Economic History Review*, Second series, Vol. 32(2), May 1980, p. 163. In the Indian epidemic during the first two decades of the twentieth century, mortality rates were reported to be between 65 and 90 per cent of those who contracted the disease. W.E. Jennings, *A Manual of Plague*, London, 1903, p. 117. Major Clemesha, Plague Medical Officer, reporting on the outbreak of plague in the neighbouring district of Patna in 1900, found that 720 out of 733 persons who contracted the plague in Barh died within the space of three-and-a-half months. The figure for Mokameh was 987 out of 1,026; cf. *Bengal Municipal Proceedings*, 'A' Series, No. 23, October 1900.

[2] Nicole Duplaix, 'Fleas: The Lethal Leapers', *National Geographic*, Vol. 173, No. 5, May 1988, pp. 673–90.

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Ring a ring o'roses,
A pocketful of posies,
Atishoo! Atishoo!
We all fall down.

'Ring o'roses' referred to the skin changes resulting from the bubonic form of the disease; sneezing was a symptom of the virulent pneumonic form; and the aroma of a posy of fragrant herbs was believed to prevent contagion. Falling down, of course, referred to death, which almost inevitably followed.[3]

It was only at the turn of the nineteenth century, during the third pandemic, that Alexandre Yersin, sent by the Institût Pasteur to investigate the disease, discovered the plague bacillus—but not how it was transmitted—while examining the buboes of a plague victim. The bacillus consequently acquired the name of both the discoverer and the institute to which he belonged.[4]

The Etiology of Plague

Plague is a bacterial disease caused by the micro-organism *Pasteurella pestis* or, as it is sometimes called, *Yersinia pestis*. Three separate strains of plague bacilli have been identified. *Pasteurella pestis antiqua* was responsible for the first great pandemic that spread through the Near East into North Africa and Europe. *Pasteurella pestis mediaevalis*, which spread to Europe during the Black Death, was the chief strain in the second great pandemic which perhaps killed 50 million people in all.[5] The third strain *Pasteurella pestis orientalis*, with its home in south China, Burma and northern India, was responsible for the third great pandemic. This pandemic began from the Yunan province in China in 1855. It claimed six million lives in India in the decade beginning 1898, and 12 million in the three decades ending 1928.[6]

Ordinarily, an infected human can neither infect other humans nor other fleas, except in the rare pneumonic form, or when the infected flea is looking for a fresh host subsequent to the death of its current human host. Like most fleas, the rat flea prefers to feed off a single species of animals. An infected rat flea will bite humans, and thereby transmit the disease, only when an outbreak of rat plague has resulted in such high rat mortality that it has insufficient rats to feed on. This means that human plague epidemics follow rat epidemics, known as epizootics.

The plague bacillus is carried from rat to rat by the bite of the flea,[7] of which there are more than 2,400 known species and sub-species. However, only about

[3] Anne Roberts, 'Plague', *History Today*, April 1980, p. 29.
[4] Duplaix, 'Fleas', p. 684.
[5] Appleby, 'The Disappearance of the Plague', p.172; Duplaix, 'Fleas', p. 677.
[6] Duplaix, *ibid*., pp. 682–85; Appleby, 'The Disappearance of the Plague'.
[7] The flea, in particular the rat flea, is a very adaptable creature, with attributes which qualify it as an effective transmitter of plague bacilli. Its mouth parts function like a combined syringe, needle and blood-culture bottle. When an infected rat is bitten, a bloody suspension of living plague bacilli

120 species/sub-species are known to transmit plague, and fewer than 20 species readily bite man. Of these, *Xenopsylla cheopsis* is the main species generally associated with the transmission of plague among human populations.[8]

Permanently settled, or enzootic, among remote colonies of burrowing rodents, plague periodically spreads erratically among them as an epizootic. Should the epizootic reach a dense population of commensal rodents living in close proximity to human populations, it may provoke human cases, as happened recently in Surat in Gujarat. While human plague epidemics invariably follow epizootics, the latter do not necessarily lead to human epidemics. The transmission of plague requires such a precise meshing of a complex chain of events that plague epidemics may be described as, at least partly fortuitous.

For plague to spread as an epidemic among human populations, not only should there be a dense population of commensal rodents in close contact with man, but also the right type of flea. This flea must bite an infected rodent and pick up the plague. The microbe incubates in the flea's digestive tract, where it multiplies and blocks the gut. If the now starving flea bites a human in a fruitless attempt to feed—and it will do so only if there has been heavy rat mortality—the blocked flea will inject countless bacilli into the blood stream, just one of which can lead to death.[9]

The human settlement pattern is of critical importance in converting an epizootic into an epidemic. It is important to note that ordinarily an infected human can neither infect other humans—except in the rare pneumonic form—nor other fleas. Plague bacilli counts in humans never reach levels statistically high enough to permit a feeding flea to suck up any of these bacilli. Rats, on the other hand, have a greater tolerance for plague bacilli, and are more thoroughly infected before the disease kills them. The higher bacillus count in the rat greatly increases the chance that a feeding flea would ingest bacteria and catch the disease.[10]

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is drawn up into the flea's stomach, where they multiply and block the gut. The flea becomes hungry, but cannot feed until the blockage is disposed of. When a blocked flea feeds, it sinks its previous meal, now cultured into a teeming mass of living plague bacilli, into the bitten area. At the same time the flea defecates, and scratching the flea bites helps to inoculate the faecal plague bacilli.

The flea can withstand enormous pressure—the secret to surviving the scratchings of the flea-bitten. It is also a star performer, a true insect olympian which can jump 150 times its own length vertically or horizontally—equivalent to a man jumping 1,000 feet—and accelerate 50 times faster than the space shuttle. It is equipped with antennae and bristles sensitive to heat, vibration and aircurrents, and can sense carbon dioxide exhaled by a passing host. It is thus well-equipped to find a host, and then hop aboard, a skill of crucial importance in plague epidemics, as infected fleas readily abandon dead, cooling hosts to hop on to rat or human hosts in the immediate vicinity.

Fleas can also survive months without feeding, and can remain frozen for a year and then revive. It is interesting to note that in the European epidemics, the epidemic would be dormant in winter, only to reappear the following spring, whereas in India the pattern was just the reverse, since fleas propagate rapidly in temperatures of 20–25°c and humidity of 0.03–0.3 per cent. Duplaix, 'Fleas', pp. 675 and 689. J.C. Russel, 'Population in Europe', in Carlo Cipolla, ed., *The Fontana Economic History of Europe*, Vol. 1, Fontana, 1972, p. 55.

[8] Duplaix, 'Fleas', p. 685. John T. Alexander, *Bubonic Plague in Early Modern Russia: Public Health and Urban Disaster*, London, 1980, p. 2.

[9] Duplaix, 'Fleas', pp. 685–86; Alexander, *Bubonic Plague*, p. 2.

[10] Appleby, 'The Disappearance of the Plague', p. 165.

Plague may take a bubonic, septicaemic or pneumonic form. The bubonic form is characterised by buboes, which are masses of tender, enlarged lymph nodes, usually in the groin, but sometimes in the armpits or the neck. They are painful until they suppurate and drain, usually one or two weeks after the onset of the illness. The patient has a high fever (102–105°F) during this period, with toxic symptoms of headache, vomiting and ataxia. He may also show a bleeding tendency, with patechiae and bruising of the skin and internal visceral bleeding, which may prove fatal.

The septicaemic form is simply an overwhelming infection. The patient dies before the buboes have a chance to develop, as the bacillus enters the blood-stream. This form of infection is ordinarily difficult to differentiate from other types of fever, such as malaria. The pneumonic form, where the bacillus enters the lungs, probably occurs in about 5 per cent of patients. Lung lesions develop and break down, so that the patient produces bloodstained sputum teeming with organisms. The patient is then a dangerous source of 'airborne droplet' infection. The proportion of deadly pneumonic cases seems to have varied in different plague epidemics, and its relation to the common bubonic type is also not clear. Though a case of pneumonic plague may infect by droplet spread, the new case is likely to revert to the bubonic form.[11]

Source and Spread of Contagion in South Bihar

The third great plague pandemic appears to have begun in the Yunan province of China in 1855 and travelled, slowly, eastwards. By 1894 it reached Hong Kong, where it killed some 10,000 persons. As Hong Kong's death toll mounted, hundreds of ships docked and departed with their familiar complement of rats. Steamships now carried the disease even faster. Before unsuspecting crews became ill, plague had fanned to places where it had previously been unknown: Japan, Australia, southern Africa and the Americas. It was thus that plague arrived in Bombay in 1896.[12]

Serious outbreaks in the Bengal Presidency began in 1898, in Calcutta and Backergange. 'Plague Interception Camps' were set up on the borders of the Bengal Presidency to monitor and to prevent the entry of the plague bacillus from the west. An interception camp was opened at the Chausa railway station in Shahabad district on 23 December 1898.[13] Attempts were also made to monitor maritime movements on the river Ganges.[14]

[11] Roberts, 'Plague', pp. 29–30; Jennings, *A Manual of Plague*, p. 66.

[12] Duplaix, 'Fleas', p. 684. It was in Bombay that a doctor from the Institüt. Pasteur finally unveiled the secret that had tormented man for so long. 'Walking filthy city streets, he observed dead rats littering plague-ridden neighbours, 75 in one hose alone. Humans who picked them up, he noted, soon fell ill themselves. In his makeshift Bombay laboratory, a tent pummelled by the monsoon, Simond dissected rats and found the plague bacillus. These plague rats, he observed, carried far more fleas than healthy ones. He also noted that, contrary to common belief, the rat fleas readily bite man. Rat . . . bacilli . . . fleas . . . . Simond had the connection.' *Ibid.*, p. 685.

[13] *Bengal Municipal Proceedings*, 'A' Series, Nos 25 and 150, February 1899.

[14] *Ibid.*, Nos 153–54, February 1899.

In the early part of 1899, plague again visited Calcutta and there were also outbreaks in 10 rural districts. The administration now turned its attention to inspection of trains leaving Calcutta for other parts of the Presidency, and also en route.[15] In the cold weather of 1900–1901, the disease spread over a large area including Patna, Gaya and Shahabad.[16] By 1905, plague was so rampant that the civil surgeon of Gaya could remark that 'Plague may now be considered as having become endemic'.[17]

Gaya district was initially more affected than Shahabad. This situation changed dramatically during the winter of 1902–1903, as plague was reported in 12 villages of Shahpur thana, nine villages in Arrah thana, and in the Dumraon and Piro thanas of Shahabad district. Arrah and Jagdishpur towns were very badly affected, and rats in the jail godown led to an outbreak in Arrah Jail. There was widespread flight from affected areas such as Dumraon and Jagdishpur. There was such panic in the latter town that 13,000 of the 14,000 inhabitants fled in the winter of 1902–1903.[18] By the winter of 1904–1905 plague had spread to the Sasaram and Buxar thanas of Shahabad, Buxar town having an especially bad time in 1910–1911. In 1907–1908 there was again a very severe outbreak in Jagdishpur, within months of abandoning the rat extermination drive.

Plague revisited Gaya district after a short respite between June 1902 and November 1903. Both rural and urban areas in Gaya and Tikari were affected by the scourge, which also spread to Daudnagar. Severe outbreaks recurred almost continuously upto 1908, 1905 being perhaps the worst year on record during the entire period of this study. Gaya town was particularly badly affected in 1906–1907. By the winter of 1908 Jehanabad subdivision, particularly Arwal thana, was severely affected. Jagdishpur town in the Shahpur thana was repeatedly ravaged.[19]

After a relative respite between 1908 and 1910, the next upswing coincided with the Census operations in 1911. Plague was particularly severe in the towns of Gaya and Jehanabad, and also in adjoining interior areas. In the winter of 1910–1911, plague outbreaks were reported in 95 out of 7,879 villages in Gaya, and in 357 out of 5,534 villages in Shahabad.[20] Census operations were once again discrupted as nearly all the inhabitants of Jehanabad town camped in huts outside the town, while 30 per cent of the population of Gaya town fled to the Mufassal (Gaya rural).[21]

[15] *Ibid.*, Nos 49–50, May 1899.

[16] *Census of India*, 1901, Vol. 6, Bengal, Bengal, by E.A. Gait, Calcutta, 1902, pp. 85–87; *Bengal Municipal Proceedings*, 'A' Series, Nos 1–2, July 1902.

[17] *Bengal Municipal Proceedings*, 'A' Series, Nos 1–2, August 1905.

[18] *Ibid.*, Nos 14–15, February 1903; Nos 34–35, April 1903.

[19] *Bengal Municipal Proceedings*, 'A' Series, Nos 1–2, August 1905; *Census of 1911*, Vol. 5, pp. 119–20; *Bengal Revenue Administration Reports*, 1900/01–1910/11. J.F.W. James, *Bihar and Orissa District Gazetteers: Shahabad*, by L.S.S. O'Malley, revised edition, Patna, 1924, pp. 59–60.

[20] *Bengal Municipal Proceedings*, 'A' Series, Nos 7–8, October 1905; Nos 86–87, February 1909; No. 57, June 1909; Nos 6–7, June 1911.

[21] Indeed, the coincedence of plague with the census both in 1901 and 1911 led to the popular belief that there was some nexus between the two. Cf. *Census of 1911*, Vol. 5, p. 37.

The horrifying cyclical pattern persisted into the second decade of the present century, and right up to 1923. During this period, plague was more severe in Shahabad district, particularly in the Dumraon and Buxar thanas. The epidemic peaked in 1914–1915, 1918–1919, 1921 before the departing violent burst of 1923, which chiefly affected Buxar.[22]

Extraordinary meteorological disturbances seem to have facilitated the spread of plague in south Bihar, as they indeed did in Europe in 1769–1771.[23] The Indian monsoons can vary sharply in quality from year to year. The two-and-a-half decades between 1894 and 1914, however, witnessed unprecedented fluctuations in weather conditions, as Table 1 illustrates. Indeed, there were only five years of normal rainfall between 1901 and 1916. During four successive years preceding the plague epidemics—1894–1897—there was either excessive precipitation, or very deficient rainfall. These fluctuations, which could well have been compounded by unusually skewed rainfall distribution during the year as well, possibly assisted the important dramatis personae, namely the plague bacillus, the rat flea and the affected rodent population, to multiply unnaturally and set the stage for the devastating human epidemics that followed.

The rainfall data in Table 1, obtained from the meteorological department, Pune, contains annual readings for half-a-century (beginning 1871), for Gaya District, and for the years 1900–1920 for Shahabad district. These observations can be taken to constitute a 'normal distribution', which arises wherever a number of random factors act independently upon a central tendency. One of the chief features of a normal distribution is that about 68 per cent of the observations are within 1 Standard Deviation from the Mean, while about 95 per cent of the observations fall within 1.96 Standard Deviation from the Mean. The data in Table 1 conforms to this pattern.

Three out of the four readings beyond 1.96 Standard Deviation occur during 1901–1914, which covers only a quarter of the entire period. Forty per cent of all readings beyond 1 Standard Deviation from the Mean also fall during this period. It is not possible to make a similar analysis for Shahabad, as annual rainfall figures prior to 1900 are not available. The Shahabad data nevertheless constitutes a natural distribution, and the Standard Deviation method can therefore be used to identify years of abnormal rainfall. It will be clear that rainfall figures collected from two places not very far from each other (Gaya in Gaya district and Dehri in Shahabad district) indicate that only seven years during the first two decades of the twentieth century can be said to have had normal rainfall. What Table 1 does not reveal, however, is the extremely unfavourable distribution of rainfall in the first decade of the twentieth century, except in 1902 (Shahabad) and 1910. Every year of the first decade of the twentieth century witnessed excessive rains and floods, and/or long periods of drought in the crucial months of October to December,[24] just as

[22] *Census of 1921*, Vol. 7, pp. 36–39; *Census of 1931*, Vol. 7, p. 37.

[23] Alexander, *Bubonic Plague*, p. 102.

[24] *Bengal Revenue Administration Reports*, 1900–1901 to 1911–1912.

Table 1
***Annual Rainfall 1871–1920* (Inches per annum)**

	Gaya			*Shahabad*		
Yr	*Rain*	*DM*	*DEV*	*Rain*	*DM*	*DEV*
1871	48.73	3.40		31.1	−10.21*	
1872	32.13	−13.20*		43	1.68	
1873	35.57	−9.76		35.3	−6.07	
1874	45.9	0.57		46.7	5.36	
1875	38.25	−7.08		42.6	1.21	
1876	45.9	0.57		34.6	−6.71	
1877	44.28	−1.05		44.7	3.39	
1878	44.36	−0.97		22.4	−19.00**	
1879	44.51	−0.82		40.9	−0.45	
1880	45.98	0.65		52.2	10.80*	
1881	48.92	3.59		44.9	3.54	
1882	45.58	0.25		31.6	−9.73	
1883	46.48	1.15		62.4	21.09**	
1884	23.96	−21.37**		29.8	−11.58*	
1885	52.45	7.21		37.7	−3.66	
1886	67.39	22.06*		46.8	5.41	
1887	44.14	−1.19		49.6	8.22	
1888	53.11	7.78		44.8	3.47	
1889	44.5	−0.83		55.1	13.76*	
1890	61.37	16.04*		30.8	−10.54*	
1891	36.93	−8.40				
1892	42.21	−3.12				
1893	47.05	1.72				
1894	63.46	18.13*				
1895	32.01	−13.32*				
1896	28.83	−16.50*				
1897	58.34	13.01*				
1898	45.59	0.26				
1899	54.86	9.53				
1900	37.19	−8.14				
1901	44.22	−1.11				
1902	39.87	−5.46				
1903	35.27	−10.06*				
1904	60.22	14.89*				
1905	41.69	−3.64				
1906	48.19	2.86				
1907	59.64	14.31*				
1908	23.15	−22.18**				
1909	61.91	16.58*				
1910	51.68	6.35				
1911	53.38	8.05				
1912	24.03	−21.30**				
1913	74.52	29.19**				
1914	40.31	−5.02				
1915	37.53	−7.80				
1916	57.21	11.88*				
1917	53.46	8.13				
1918	52.17	6.84				
1919	58.58	13.25*				
1920	54.55	9.22				
Mean			46.63			41.3
STD			11.18			9.78

Source: Indian Meteorological Department, Pune.
Note: DM: Deviation from the Mean
STD: Standard Deviation
* over 1 Std. Dev.
** over 1.96 Std. Dev.

the infections resurfaced after the mandatory summer break. Such unusual weather made evacuation all the more difficult.[25] It was against this backdrop of capricious weather conditions that plague epidemics spread in these districts.

Bubonic plague can spread only as fast as the prevalent means of transport, since in normal circumstances neither rats nor fleas can venture widely on their own to cause more than sporadic local outbreaks. Rats move slowly, sometimes taking as long as six weeks to cover 100 yards. A rat-borne epidemic has therefore been described as a 'creeping epizootic'. The infection typically moves slowly and deliberately, house by house, street by street, devastating some areas, barely touching others, and bypassing still others, as the infection moves from one rat community to another and then, as the rats die, transferring itself to humans living in these areas.[26]

In medieval outbreaks, bubonic plague typically arrived by ship, and crept slowly to the interior. While the plague may have been a 'creeping epizootic' in the ancient and medieval world, it spread rapidly from Calcutta to upcountry regions in early twentieth century India on account of the extensive railway network, which transported grain along with its complement of infected rats.[27] However, it may have also travelled along other major trade routes such as roads and waterways. The East India Railway (EIR) traversed the thickly populated portion of northern Shahabad, while the grand chord line of the EIR wove its way through the heart of both the districts. The plague established itself in areas of urban concentration contiguous to the EIR, such as Gaya and Arrah towns, in the cold weather of 1900.[28] The epidemic then crept along the areas adjoining the railway line, never wandering very far from it, in the classic fashion of the creeping epizootic. Contemporary administrators likened the spread of plague to a fire eating its way along a hillside, making more headway here and there, and at times leaving places untouched amidst the general conflagration, pursuing its course of destruction until the hot winds came and dried the disease.[29]

Gaya and Arrah were the only towns in the two districts with a population exceeding 25,000.[30] It is, therefore, not surprising that they were the first to be hit,

[25] *Bengal Municipal Proceedings*, 'A' Series, Nos 7–8, October 1905.

[26] Appleby, 'The Disappearance of the Plague', p. 164; Alexander, *Bubonic Plague*, pp. 6–7.

[27] *Bengal Municipal Proceedings*, 'A' Series, Nos 3–4, June 1904; Jennings, *A Manual of Plague*, pp. 42, 44. The heavy mortality of trading classes lends credibility to the view that grain was the medium through which plague was transmitted to the local rodent population, amongst whom it spread as an epizootic before being transmitted to humans. *Census of India, 1911*, Vol. 5, Bengal, Bihar, Orissa and Sikkim, by L.S.S. O'Malley, Calcutta, 1913, p. 72. It is interesting to draw a parallel with the Moscow plague epidemic of 1771, where plague entered in shipments of wool and silk; cf. Alexander, *Bubonic Plague*, p. 268.

[28] *Census of 1901*, Vol. 6, pp. 85–87.

[29] *Bihar Municipal Proceedings*, 'A' Series, Nos 1–2, August 1905.

[30] Gaya town had a population of 71,288 and Arrah town a population of 46,170 at the time of the 1901 Census. There were four other towns with a population between 10,000 and 25,000 each, viz., Sasaram (23,644), Dumraon (7,236), Buxar (13,945) and Jagdishpur (11,451). All these towns lay along the EIR, and were all plague-affected. Jahanabad town, with a population of 7,018, which lay

since plague typically flourishes in areas of human concentration. It is for this reason that medieval European plague epidemics mainly convulsed great cities like London, while smaller cities and market towns were less affected. Villages and hamlets were relatively safe because they had fewer inhabitants.[31]

As the plague epidemic spread, panic ensued. The Census operations of 1901 were disrupted as villagers abandoned established sites.[32] There was a sudden increase by over Rs 100,000 in the payment of land revenue by money order as people were unwilling to go to the headquarters to pay the revenue in person on account of the plague.[33]

The Pattern of Plague Epidemics

Seasonal Occurrence

Plague ravaged the two districts from 1900, till it disappeared quite mysteriously after 1923.[34] The epidemics almost invariably began after the onset of the rainy season, and fell off as the hot season approached, in contrast to cholera and fever. This was also in contrast to the medieval European pattern where plague remained dormant during the winter months.[35] A statistical analysis of the distribution of the incidence of plague in 1902, 1903, 1904 and 1910, for which monthly figures are available, reveals the following: over 90 per cent of the deaths occurred in the five months from December to April, with about one-third of the annual mortality occurring in a single month, viz., March (Table 2).[36]

This seasonal pattern derived from a fortuitous simultaneous occurrence of at least four attendant circumstances. First, *Yersina pestis*, the plague bacillus, is more sensitive to the heat of the Indian summer, than to the cold season; it thrives in moderate humidity within a temperature range of 10–27°C. Second, fleas tend to multiply rapidly in temperatures of 20–25°C, and a humidity of 0.03–0.3 per

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on the Patna–Gaya railway line, was also very badly affected, particularly in 1911. *Census of 1911*, Vol. 5, pp. 27, 119; *Census of India*, 1921, Vol. 7, Bihar and Orissa, by P.C. Tallents, Patna, 1923, pp. 38–39; *Census of India*, 1931, Vol. 7, Bihar and Orissa, by W.C. Lacey, Patna, 1933, p. 37; *Bengal Revenue Administration Report*, 1907–08.

[31] Appleby, 'The Disappearance of the Plague', p. 162.

[32] The flight of villages from affected areas is reminiscent of medieval Europe. There was an exodus from Arrah thana, while over 11,000 persons fled the Tikari thana between the preliminary and final census counts in 1901. The population of Nawadah thana swelled on account of plague refugees. *Census of 1901*, Vol. 6, pp. 85–87; *Census of 1911*, Vol. 5, pp. 119–20.

[33] *Bengal Revenue Administration Report*, 1900–1901.

[34] *Census of 1931*, Vol. 7, pp. 35, 37. This rather sudden disappearance is reminiscent of the European experience, which is the subject of a keen and inconclusive debate. Roberts, 'Flea'; Appleby, 'The Disappearance of the Plague'. We can only speculate that since plague is primarily a disease of rodents, there was, for some reason, a decline in epizootics.

[35] L.S.S. O'Malley, *Bengal District Gazetteers: Shahabad*, Calcutta, 1906, p. 45; *Bengal Municipal Proceedings*, 'A' Series, Nos 30–35, April 1903; Russel, *The Fontana Economic History of Europe*, Vol. 1, p. 55.

[36] Compiled from *Bengal Municipal Proceedings*, 'A' Series, various numbers.

Table 2
Seasonal Distribution of Plague

	1902		*1903*		*1904*		*1910*			
	Gaya	*Shahbd*	*Gaya*	*Shahbd*	*Gaya*	*Shahbd*	*Gaya*	*Shahbd*	*Total*	*Distrib. (in %)*
Jan	666	39	0	1,115	634	1,737	37	707	4,935	10%
Feb	1,980	241	5	1,494	1,394	2,759	85	1,189	9,147	18%
Mar	4,808	1,720	290	1,947	3,017	2,770	148	2,349	17,049	34%
Apr	2,849	2,214	383	1,087	815	1,134	38	836	9,356	19%
May	429	246	42	59	65	105	2	64	1,012	2%
Jun	17	8	1	0	7	13	1	10	57	0%
Jul	6	0	0	0	7	13	11	2	39	0%
Aug	1	14	0	0	106	171	28	13	333	1%
Sep	0	135	3	2	90	142	50	101	488	1%
Oct	5	101		88	47	79	0	115	435	1%
Nov	9	164	43	580	130	261	29	516	1,732	3%
Dec	20	199	242	1,224	617	1,300	148	1,274	5,024	10%
Total	10,790	5,081	1,009	7,596	6,929	10,484	542	7,176	49,607	100%

Source: Bihar Municipal Proceedings, Various Proceedings, 'A' Series.

cent. (Fleas were most in evidence during the first three months of the year, and large numbers were seen at the time of the the mango blossom in February and March.) Third, March is also *the* breeding period of rats, although there are always sufficient rats available in earlier months to carry on the infection. Fourth, people tend to sleep out in the open more often in summer, whereas cold and wet conditions drive them indoors. This increases the chances of contact with rats in crowded settlements.[37]

Cyclical Pattern

While plague remained endemic in both the districts for over two decades, severe epidemics were punctuated with years of markedly low mortality. The widespread popular belief that bubonic plague was cyclical was the subject of keen debate in administrative circles. The magistrate of Patna commented that 'the experience of the last five years has led people to the generalisation that the plague is severe in alternate years'.[38]

The theory of high mortality in alternative years was, however, severely mauled by the figures for 1905–1906 and 1906–1907. Indeed, the aggregate district, or even thana, figures do not reveal any significant cyclical pattern. There were others, however, who argued that the cyclical pattern could not be established on the basis of the district or thana returns, which showed in a stark manner how deceptive

[37] Jennings, *A Manual of Plague*, pp. 28–30, 45, 53. Russel, *The Fontana Economic History of Europe*, Vol. 1, p. 55; Alexander, *Bubonic Plague*, p. 4; *Bengal Municipal Proceedings*, 'A' Series, Nos 7–8, October 1905; Nos 79–80, September 1907.

[38] *Bengal Municipal Proceedings*, 'A' Series, Nos 3–4, June 1904; Nos 21–22, August 1908.

and fallacious unmindful aggregations can be. 'The alternative severity in the returns from the plague is marked', wrote Captains Connor and Cooks in their *Report on Plague Work in Bihar during 1907*, 'but to appreciate the point, it is necessary to take separate villages ravaged by plague, and not the aggregate cases of thanas in which there are probably hundreds of villages. For, in a thana, some villages may be very slightly affected, whilst others are severely affected in the same season, so that the aggregate from year to year does not show this periodicity'.[39]

Plague among humans is perhaps best perceived as a secondary epidemic arising out of several epidemics afflicting commensal rat populations. Each rat community would have a geographical spread no bigger than a village. They would be greatly diminished in the epidemic, as it is only at this stage that the fleas start looking for human hosts, thereby transmitting the epidemic to humans. It would take at least a year or two for the rat population to regenerate before it could be infected again. In the medieval European epidemics it was observed that rats tended to increase in explosive fashion every three to four years.[40]

Spatial Bias

The spatial bias of the plague epidemics was alluded to earlier. The scarcity- and famine-prone southern hilly tracts in the two districts, relatively sparsely populated and far removed from the main communication highways, were hardly touched by plague.[41] On the other hand, urban settlements adjoining the EIR were the worst affected, as plague has a natural affinity with densely populated areas. It was perhaps on account of heavy human concentration in rural areas that, in contrast to medieval Europe, villages were almost as severely affected as towns.[42] The average population density of the two districts, which were almost wholly rural, was far in excess of that of medieval Europe: 449 persons per square mile (Gaya) and 478 (Shahabad) in 1891, compared to the medieval western Europe average of around 48.3 in 1800. Even this average estimate is on the higher side, since typical pre-modern mortality rates in Europe began declining between 1750–1800,[43] something which did not occur in India before 1921.

It so happened that the EIR passed through the most densely populated thanas, especially in Shahabad district: Atari (495), Tikari (650), Arrah (989), Shahpur (785), Buxar (539) and Dumraon (779). It was these thanas which were most affected by plague.

The problem was compounded by the clustered settlement pattern of the villages. It is interesting at this point to compare the spread of bubonic plague in South Bihar

[39] *Bengal Municipal Proceedings*, 'A' Series, Nos 79–80, September 1907.

[40] Russel, *The Fontana Economic History of Europe*, Vol. 1, p. 55; Alexander, *Bubonic Plague*, p. 4.

[41] *Bengal Municipal Proceedings*, 'A' Series, Nos 3–4, June 1904.

[42] Jennings, *A Manual of Plague*, p. 56.

[43] Andre Armengard, 'Population in Europe, 1700–1914', in Carlo Cipolla, ed., *The Fontana Economic History of Europe*, Vol. 3, *The Industrial Revolution*, Fontana, 1973, pp. 28–38.

and Bengal, where the plague bacillus first reached India in 1895. Major Clemesha of the Indian Medical Service, while pointing out the remarkable immunity of Bengal (outside Calcutta city) to the plague, remarked in 1906:

> A house so constructed as not to be suitable for rats to live in, and not containing any food to attract rodents, would probably remain uninfected unless a case of pneumonic plague was placed in it. There is the greatest difference between the Bihar and the purely Bengali villages. In Bihar the mud houses are closely packed together, so as to utilise every inch of ground. There are no streets, narrow passages between the walls only remaining. The village is compact; it may consist of several 'tolas' or hamlets separated by a considerable distance, but each such hamlet is a compact, overcrowded unit. In Bengal, exactly the opposite tendency prevailed. Villages were a cluster of houses not quite contiguous and each house was buried in a thicket of bamboo and thick vegetation, having its own compound and the individual houses are often some distance apart. Undoubtedly, the Bihar village was the ideal type for plague to flourish in. It is certainly infested with rats.[44]

The freedom of rural Bengal from plague was mainly due to the lesser contact rats had with humans compared to other parts of India. It had a more dispersed settlement pattern. The houses were also more airy and were often made of solid masonry. Thus *Mus rattus,* the species of rat that carried the plague in this part of the world, was comparatively rare in Bengal houses. Experiments also showed that the plague bacillus retained its vitality for a very considerable period in cow-dung, the material composing the floors of most houses in rural Bihar.[45] There was, of course, a constant influx of emigrants to Bengal from infected areas to seek employment in the fields, or on the railways, or in the mills and factories. The peculiar etiology of the disease, however, made its transmission from person-to-person contact quite rare.

Class Selective

Epidemics in traditional agricultural societies, untouched by modern public health measures, are putatively class selective. Crisis death followed scarcity and famine

[44] *Census of 1911,* Vol. 5, p. 73. The 'raiyat's' house was also his grainstore, which was naturally infested with rats. For this reason the trading classes were heavily hit, as they generally lived in dark, rat-infested store godowns. *Census of 1921,* Vol. 6, p. 72. It is interesting to compare the high grain-trader mortality with clergy deaths in medieval Europe. The clergy comprised Celibates who normally lived alone or with a companion or two, in contrast to other families, usually two adults and differing numbers of children. Normally one rat family had the run of a house, so it was likely that the priest would get infected. Cf. Russel, *The Fontana Economic History of Europe,* Vol. 1, p. 55. A grain trader's rat-infested godown, on the other hand, could support more rat families on account of the plentiful supply of food, thereby increasing the risk of infection.

[45] Jennings, *A Manual of Plague,* pp. 28–29.

with clockwork regularity, and the poor were more susceptible both on account of their poor nutritional status and their being priced out of the food market. Social deprivation, dysfunctional behaviour, vagrancy and migration, all of which are associated with subsistence crises, also diffused infection. Amartya Sen has observed that even famines typically kill not so much by starvation, but by magnifying the forces of death normally prevalent in the pre-famine period.[46]

Several, perhaps most, pre-modern diseases, particularly those that were stomach related, such as cholera, gastroenteritis and fevers of various sorts, were lower class-selective and scarcity related. The case of plague—or at least the manner in which it spread in south Bihar—is a little peculiar in that it had something of an upper class, and upper caste, bias. The unusually high incidence of trader mortality was alluded to earlier. *Halwai* shops and *dhabas*, similarly, rarely escaped, since *Mus rattus* had a marked preference for sweets and cooked food such as chappatis. Banias and Brahmins, moreover, were very loathe to associate with any rat-killing operations, because it was considered sacrilegious to kill an animal that pulled Lord Ganesh's chariot. The Vaishnavs were pure vegetarians, and were opposed to killing animals of any kind. The rat-trappers, moreover, were almost invariably the low caste Musahars, whose entry into the house was considered polluting. Major Clemesha observed that villages dominated by the 'better class of natives—Rajputs and Babhans'—were more susceptible, as their houses were practically inaccessible to plague medical staff as their women were 'strictly pardanashin'.[47]

The efficacy of the plague medical staff in containing plague is arguable. However, there are other reasons to suspect that plague was upper class-selective. It was well known that evacuation markedly reduced plague mortality. The poor mostly camped in the open, in temporary mat huts. The more well-to-do, on the other hand, frequently fled to other houses, and therefore continued to be susceptible.[48] There were also complaints of gang robberies in empty houses, and the well-to-do therefore kept returning to their houses to protect their property, especially since the epidemic was at its peak during the storage period of the valuable opium crop.[49]

To a substantial extent, therefore, the spread of plague in south Bihar underscores the importance of disease as an independent variable in determining pre-modern mortality rates.[50]

[46] John D. Post, 'The Mortality Crises of the Early 1770s and European Demographic Trends', *Journal of Interdisciplinary History*, Vol. 21, Summer 1990, pp. 42–46; Amartya Sen, 'Famine Mortality: A Study of the Bengal Famine of 1943', in E.J. Hobsbawm et al., eds, *Peasants in History*, Delhi, 1980, pp. 202–5.

[47] *Bengal Municipal Proceedings*, 'A' Series, No. 23, October 1900; Nos 79–80, September 1907; Nos 86–89, February 1909.

[48] *Ibid.*, Nos 1–2, August 1905.

[49] *Ibid.*, Nos 7–8, October 1905; Nos 88–89, August 1905.

[50] Wrigley and Schofield have underscored this independent status of disease in an influential work. Anthony E. Wrigley and S. Schofield, *The Population History of England, 1541–1871*, Cambridge, Mass., 1981, pp. 354–55, 452.

Gender and Age Bias

The last persons to be evacuated from plague affected areas were women, children and the aged. It is therefore not surprising that these groups suffered most from the plague.[51] Dressing the dead, handling the clothes of the deceased, and simply staying more at home, exposed the female sex to greater risk when the blocked flea sought a fresh host. According to official estimates, 57 per cent of those who died on account of plague in Bihar were females.[52] In Shahabad, 62 per cent of all 'official' plague deaths were those of females.[53] To view these figures in their true perspective, it must be borne in mind that official figures had a long history of understanding female deaths. 'The habits of women', remarked P.C. Tallents, author of the 1921 Census of Bihar and Orissa, 'expose them much more to the attacks of the rat flea than do those of the men; they live less in the open air, they go barefooted, they sweep the floors and handle the grain, they nurse the sick and assemble round the corpses for the purposes of mourning just at the time when there is the greatest risk of infection. Wherever . . . there is plague there is likely to be heavy female mortality.'[54]

It is intriguing that the reversal in the sex ratio in the districts, which was traditionally in favour of females, coincided with the plague epidemics, as can be seen from Table 3.

Table 3
Sex Ration

Females per 1,000 males

	Gaya		*Shahabad*	
	Actual	*Natural*	*Actual*	*Natural*
1872	1043		1064	
1881	1036	1026	1068	1023
1891	1043	1026	1082	1126
1901	1037	1009	1096	1054
1911	1035	992	1062	1010
1921	1003	964	1029	976
1931	1001		995	

Source: Census of India, 1881, 1931.
Note: Natural population is the actual population corrected for migration.

This fall in the proportion of females is a little puzzling, because both the districts had a net outflow of population right up to 1931, and emigration always had a male bias. Table 6 (p. 440) reveals that the fall applied equally to the natural population as well as to the actual population, although emigration helped maintain an illusory surplus in the latter.

[51] *Bengal Municipal Proceedings*, 'A' Series, Nos 7–8, October 1905; *Census of 1911*, Vol. 5, pp. 37, 268; Jennings, *A Manual of Plague*, p. 48.
[52] *Census of 1931*, Vol. 7, p. 168; *Bengal Municipal Proceedings*, 'A' Series, Nos 6–7, June 1911.
[53] *Bengal Municipal Proceedings*, 'A' Series, Nos 6–7, June 1911.
[54] *Census of 1921*, Vol. 7, p. 168.

One way of testing the hypothesis that the sex bias of plague mortality lay behind the decline in the proportion of females in the population is by comparing the decline in the seven affected thanas with the district averages. Between 1891 and 1911, the proportion of females in the actual population declined by 0.6 per cent in Gaya district, and by 1.8 per cent in Shahabad district. The decline in the affected thanas of Gaya was as follows: Tikari 2.2 per cent, Gaya town 7.1 per cent, Gaya Mufassal 1.2 per cent, and Atari 0.9 per cent. In the Shahabad thanas, Arrah and Dumraon showed spectacular declines of 4.8 per cent and 5.4 per cent respectively.

It could plausibly be argued that elevated female mortality during the plague epidemics explains the fall in the proportion of females after 1891 in the above five thanas. However, Buxar and Shahpur, while showing significant declines of 1.1 per cent and 0.7 per cent respectively, do not validate the hypothesis. Moreover, the continued fall after 1921 remains a demographic enigma, although this could possibly be explained by the decline in emigration in the 1920s.[55] Since sex ratio figures are complicated by migration trends; one has to be very cautious in drawing definitive inferences regarding the impact of plague on the sex ratio, especially since the decline extended to non-plague-affected districts as well. What could perhaps be said with some degree of confidence is that the decline in these palgue-affected districts predated the decline elsewhere in the province, reducing them from having the highest to having the lowest proportion of females in the province.[56]

Plague Mortality

According to the official figures, plague claimed 68,000 lives in Shahabad between 1901 and 1910, and 50,314 lives in Gaya district (except 1901 and 1909, for which no figures are available) during the same period (Table 4).[57] We have consequently made some projections for these two years for Gaya, so as to make the mortality in Gaya commensurate with that in Shahabad. We could, perhaps, round off the figures to about 125,000 during the first decade for both the districts taken together. The official toll in Shahabad district during the next decade was around 13,000 each in 1911, 1914 and 1918,[58] and 9,000 in 1921–24.[59] We could perhaps round off the figure to 50,000 for the entire period from 1911–1924. Figures for Gaya district for this period are not available, but we could perhaps take a conservative estimate at, say, 60 per cent of the Shahabad figure, or 30,000. Thus, we get a total mortality figure of 205,000 for the two districts during the entire period 1901–1924.

[55] *Census of 1931*, Vol. 7, pp. 35–38.

[56] *Census of 1921*, Vol. 7, p. 167.

[57] *Bengal Municipal Proceedings*, 'A' Series, Various Proceedings; *Census of 1921*, Vol. 7, pp. 119–20.

[58] J.F.W. James, *Bihar and Orissa District Gazetteers: Shahabad*, p. 60; *Census of 1921*, Vol. 7, p. 38.

[59] *Census of 1931*, Vol. 7, p. 37.

It was admitted in official circles that the mortality returns generally made by the police were 'extremely primitive'. Since child, and especially female mortality, was heavy in plague epidemics it is almost certain that under-reporting of plague deaths was even higher than usual.[60] It is also almost certain that a large number of plague deaths were returned as 'fever deaths', the pet diagnosis of the village chaukidar.[61] It is pertinent to note that there was a large incidence of the septicaemic form of plague in the area, which was difficult to distinguish from the ordinary malarial fever, as it killed the patient before the diagnostic buboes got a chance to develop.[62] The number of deaths ascribed to 'fever' suddenly jumped by 11,000 in 1901, and fell by 22,500 the next year in Gaya district, a most suspicious variation, especially since the rise and fall replicated the plague cycle.[63] Major Clemesha reported several varieties of plague during the Barh epidemic in 1900, including 'a particularly interesting variety, as it was not infrequently mistaken for cholera', where the bacillus attacked the gastrointestinal tract. In one particular case, the railway doctor actually diagnosed cholera as the cause of death, but this was followed swiftly by two (undoubtedly) plague cases in the same house.[64] Keeping these factors in mind, we could perhaps escalate the mortality figure by about 20 per cent—although even an escalation of 40–50 per cent could be defended—which brings us to a figure approaching one quarter of a million.

Plague mortality was concentrated in a few thanas and towns adjoining the EIR. Therefore, the census figures could perhaps be used as a check on the above estimate. Tables 5 and 6 based on census figures, give us some indication of this great scourge in the severely affected thanas and towns. The census enumeration of both 1901 and 1911 are, however, a little deceptive, as both these counts were done at a time when plague was raging. The accuracy of these counts is therefore arguable. There was general panic, and people were also temporarily fleeing from established sites. The huge losses of 10 per cent and 20 per cent respectively in the Arrah and Tikari thanas in 1901 relative to 1891, and the concurrent unnatural increase of 15 per cent in the Nawadah thana are largely attributable to this flight.

[60] *Bengal Municipal Proceedings*, 'A' Series, Nos 79–80, September 1907. J.A. Bourdillon surmised that there was a deficiency between 15 and 20 per cent in the registration of female deaths. There was a similar under-reporting of infant deaths relative to adult males. *Census of India*, 1881, Vol. 6, Bengal, by J.A. Bourdillon, Calcutta, 1883 p. 65. According to Kingsley Davis, the under-registration of deaths in British India definitely exceeded 30 per cent at all times, and was probably nearer 50 per cent; Kingsley Davis, *The Population of India and Pakistan*, Princeton, 1951, p. 34.

[61] *Bengal Municipal Proceedings*, 'A' Series, Nos 1–3, November 1901.

[62] *Ibid.*, Nos 1–2, November 1904.

[63] This led O'Malley to infer that plague mortality in Gaya district was around 26,000 during the first eight months of 1902, as against 10,790 officially reported for the full year. L.S.S. O'Malley, *Bengal Distict Gazetteers: Gaya*, Calcutta, 1906, p. 97. L.S.S. O'Malley, *Bengal District Gazetteers: Shahabad*, p. 44.

[64] *Bengal Municipal Proceedings*, 'A' Series, No. 23, October 1900. Such diarrhoeaic symptoms were a marked feature in many plague cases in Gaya district as well. *Ibid.*, Nos 79–80, September 1907.

Table 4
Plague Mortality: 1901–1910

	Gaya	*Shahabad*	*Total*
1901	4,836	2,418	7,254 (Guess)
1902	10,790	5,081	15,871
1903	1,009	7,596	8,605
1904	6,929	10,484	17,413
1905	18,209	16,222	34,431
1906	4,757	5,927	10,684
1907	7,645	10,067	17,712
1908	433	2,024	2,457
1909	217	1,005	1,222 (Guess)
1910	542	7,176	7,718
Total	55,367	68,000	123,367

Source: Same as Table 2.
Note: Plague mortality in Gaya in 1901 has been taken at 200 per cent of the Shahabad figure, i.e., in roughly the same ratio as in 1902. Similarly, the mortality in Gaya in 1909 is taken at 20 per cent of the Shahabad figure, roughly the same ratio as prevailed in 1908.

The huge losses registered in the towns of Jehanabad and Gaya, and possibly Arrah, in 1911, are similarly explained, since a major portion of this loss was made good in 1921.

The 1901 census, moreover, also reflects the large fever mortality in the northern thanas of Gaya, and especially Shahabad. These thanas were in fact on a demographic downswing right from 1881. The 1921 count, on the other hand, is complicated by the influenza pandemic, which claimed lives in every thana in the two districts.[65] When we consider the (raw) population differentials between 1891 and 1921 in the plague-affected thanas, about half the decline is during 1891–1901. Even when we make allowance for the high fever mortality, such a massive decline appears unlikely, and would seem to reflect the operational difficulties involved in conducting a census count just as the plague scare was spreading fast and mortality had begun to mount. It is, consequently, practically impossible to deduce directly the plague mortality from the raw census data without making some corrections.

What has been done in Table 5 is that the total population of the two districts has been calculated, excluding the plague affected thanas (Districts, Table 5). The population's growth rate for the period 1891–1921 (GR 1891–1921) has been worked out, which has then been applied to the plague-affected thanas. We thus arrive at a hypothetical population for the plague-affected thanas in the year 1921 (Cor. Total). The difference between this hypothetical figure and the actual census count is the 'Corrected' figure, which would appear to be the population missing on account of the plague in these seven thanas.

The raw census figures in Table 5 show that between 1891 and 1921 Atari lost 26 per cent of its population, Tikari 5 per cent, and Gaya town and Mufassal taken

[65] Alok Sheel, 'Long-term Demographic Trends in South Bihar: Gaya and Shahabad Districts, 1811–1921', *The Indian Economic and Social History Review*, Vol. 29(3), July–September 1992, pp. 323–48.

Table 5
Total Population loss in affected Thanas

Thana	*1881*	*1891*	*1901*	*1911*	*1921*
Gaya Town	75,150	78,908	69,890	48,848	66,132
Gaya Rural	202,206	179,963	167,831	192,096	184,007
Atari	96,750	123,840	105,458	93,848	91,913
Tikari	176,875	183,950	148,575	166,263	155,650
Arrah	312,582	350,092	315,708	275,072	275,072
Shahpur	195,804	197,762	187,972	162,517	152,727
Buxar	163,152	166,415	156,626	148,468	130,522
Dumraon	259,903	270,299	259,903	233,913	220,918
Total	1,482,422	1,551,229	1,411,962	1,321,024	1,276,940
Cor. Total					1,576,891
Districts	2,607,981	2,654,362	2,592,872	2,693,214	2,698,274
GR 1891–1921	0.02				
1921–1891 (raw)	–274,288				
% Loss	–18%				
Corrected	–299,951				
% Loss	–19%				

Source: Census of India, 1891, 1901, 1911, 1921.

together, 3 per cent. The mortality in Shahabad was much higher: Arrah lost 21 per cent, Shahpur 23 per cent, Buxar 22 per cent and Dumraon 18 per cent. These figures, however, include mortality on account of 'fever' and influenza. The 'Corrected' total indicates a population loss of 19 per cent on account of the plague up to 1921. This figure excludes the mortality on account of fever and influenza. These would have affected the non-plague affected thanas as well. When this percentage is computed into numbers, the result is consistent with the earlier estimate that showed that plague claimed about one quarter of a million victims in Gaya and Shahabad districts between 1901 and 1924. If anything, the number is nearer 300,000, as the mortality on account of the parting burst in Shahabad district is not included in this calculation. If this is included, the population loss in the affected thanas would go up by 20 per cent. It may be noted that the estimate derived from the census counts does not take into account plague mortality outside the seven affected thanas.

Plague mortality in the affected thanas, boggling though it may appear, and after provision is made for large-scale under-reporting of deaths, was nowhere near the 'Black Death' level in England in which 20 per cent of the population is said to have perished in just two years, between 1348–1350.[66] In the seven severely affected thanas the loss of 20 per cent was spread over two decades.

Plague is estimated to have claimed 68,407 lives in London in 1665, 39,200 in Marseilles in 1720, and 56,672 lives in Moscow in 1771.[67] The south Bihar figures

[66] Russel, *The Fontana Economic History of Europe*, Vol. I, p. 55.
[67] Alexander, *Bubonic Plague*, p. 303.

appear to be modest in comparison: 15,800 deaths were recorded in the whole of Shahabad district in the first six month of 1905, when the plague epidemic was at its peak, and 10,000 in Gaya in the first three months of the same year. Although most of these deaths were confined to a few thanas, there were no horrifying urban disasters of the medieval Europe type simply because there were no comparable urban centres like London, Marseilles or Moscow. Unlike Europe, however, rural morbidity, and hence mortality, was high as plague fanned out to clustered village settlements over a large area in densely populated thanas adjoining the EIR.

The two districts did not have any big urban centre, apart from Gaya, and no trend towards urbanisation is discernible. There was nevertheless a modest increase in the urban population till 1891 when the plague caused a rather dramatic de-urbanisation, both by way of mortality and flight. Towns such as Nawadah, Aurangabad and Bhabhua, which were largely unaffected by plague, maintained their slow and sporadic growth (Table 6).

In medieval Britain, where the etiology of the disease was unknown, as soon as an epidemic broke out in earnest, those that could afford to do so, left the stricken town or village. The well-to-do certainly took flight from London. However, quarantine measures were often enforced, and the residents of affected villages were prevented from leaving their houses for fear of spreading the plague to other areas, frequently with disastrous consequences.[68] While quarantine measures were also adopted in Shahabad and Gaya, these were such as to segregate infected persons, and those who had been in contact with them.[69] Indeed, large-scale flight was officially encouraged from affected areas and undoubtedly helped reduce the toll, stupendous though it nevertheless was.

Several measures were tried by the administration in their desperate bid to contain the plague epidemic, without much success, however.[70] Disinfection did not target the rats or the fleas, the main carriers of the disease. The coverage of plague hospitals and inoculations was very low, and their efficacy was never conclusively established, as a number of persons died despite the inoculations, and in the hospitals. Sixty-eight out of the 129 persons treated by the 'Plague doctor' in Shahabad died in the winter of 1902–1903. Figures from Bankipore Jail, where detailed records of each and every prisoner were kept, showed that while two-thirds of non-inoculated prisoners who contracted the plague during the epidemic died, 20 per cent of those who had been inoculated also perished.[71]

Rat killing did provide perceptible relief where it was resorted to on a large-scale, but this was attempted only in Jagdishpur town, and that too for a brief period. Since rats are very prolific, and their populations recover very fast, this method was found to be very expensive, and was soon discontinued. A total of 1.5

[68] Roberts, 'Plague', p. 33.
[69] *Bengal Municipal Proceedings*, 'A' Series, No. 89, March 1899; Nos 49–50, April 1899.
[70] *Ibid.*, Nos 7–8, October 1905; Nos 68–69, September 1907.
[71] *Ibid.*, Nos 1–2, July 1902; Nos 34–35, April 1903.

Table 6
Urban Population Trends, 1881–1931

	1881	*1891*	*1901*	*1911*	*1921*	*1931*
Gaya	76,415	80,383	71,288	49,921	67,562	88,005
	1.00	1.05	0.93	0.65	0.88	1.15
Arrah	42,998	46,905	46,170	38,549	40,769	48,922
	1.00	1.09	1.07	0.90	0.95	1.14
Sasaram	21,818	22,713	23,644	23,097	22,308	24,221
	1.00	1.04	1.08	1.06	1.02	1.11
Dumraon	17,429	18,384	17,236	15,042	14,132	14,421
	1.00	1.05	0.99	0.86	0.81	0.83
Buxar	16,498	15,506	13,945	11,301	10,098	13,499
	1.00	0.94	0.85	0.68	0.61	0.82
Daudnagar	9,870	9,851	9,744	9,149	8,511	11,699
	1.00	1.00	0.99	0.93	0.86	1.19
Jagdishpur	12,568	12,475	11,451	8,924	8,564	9,661
	1.00	0.99	0.91	0.71	0.68	0.77
Jehanabad	5,286		7,018	4,764	6,956	8,764
	1.00		1.33	0.90	1.32	1.66
Nawadah			5,908	6,828	9,533	7,485
			1.00	1.16	1.61	1.27
Aurangabad			4,685	5,799	4,833	7,428
			1.00	1.24	1.03	1.59
Bhabhua	5,728	10,216	5,660	5,452	5,435	6,002
	1.00	1.78	0.99	0.95	0.95	1.05
Tikari	12,187	11,532	6,437	5,861	4,827	5,481
	1.00	0.95	0.53	0.48	0.40	0.45
Gaya District	100	99	96	101	101	112
Shahabad District	100	107	100	95	93	102

Source: Census of India, 1881–1931

million rats were killed at a cost of Rs. 23,787 over two years in Jagdishpur.[72] The attempts in other places were half-hearted: 125,504 rats killed in Gaya municipality over three years, 12,220 rats killed in Tikari municipality, and 113 rats killed by the police (sic) in Daudnagar municipality in 1907.[73]

Rat poison was distributed at some places, but this did not prove to be popular. Apart from the general opposition to killing of rats on religious grounds, widespread rat mortality, whatever the cause, was popularly linked to the onset of the plague. Since the arrival of 'officials' was triggered by rising death rates, officials were frequently blamed for triggering the epidemic as well. The fact that there were virulent plague epidemics while the census operations were being conducted both in 1901 and 1911 also fostered distrust and fear of officials. Much of the rat-killing operations was consequently done by professionals—mainly Musahars—who indiscriminately targeted the innocuous brown field rat (*Mus decumanus*), in

[72] *Ibid.*, Nos 79–80, September 1907.
[73] *Ibid.*, Nos 86–87, February 1909.

addition to *Mus rattus*, so as to maximise their earnings. Since there was no popular participation, once the reward—a very modest one pice per rat—was withdrawn, rat killing ceased altogether, and within a year the plague resurfaced in Jagdishpur with renewed virulence, after a gap of three years.[74]

In the absence of the total breakdown of communication between the administration and the people, the onset of plague was the signal for spontaneous flight. The flight in fact began as soon as rats were observed to be dying in large numbers. As it turned out, this simple rule of the thumb was the only reliable preventive,[75] and helped reduce plague mortality, especially where it was comprehensive and timely.

Concluding Remarks

Plague spread in the districts of Gaya and Shahabad with a bang in the first winter of the twentieth century. The plague bacilli probably entered Calcutta by ship from the Far East, as part of the third great plague pandemic, from where they were rapidly transported to upcountry regions via the railway network.

Whatever the source of infection, plague is primarily a disease of rodents which only incidentally affects humans. Fortuitous factors facilitated both its rapid spread and demise in the region, such as unusual meteorological conditions, the fact that the EIR traversed very densely populated revenue thanas, and the clustered settlement pattern. Unlike medieval Europe, therefore, plague spread rapidly and affected villages almost as badly as it did urban areas.

Apart from its spatial bias, the epidemic also had a seasonal, cyclical, social, gender and age bias. Unlike medieval Europe, the plague was most active in the cold weather and practically dormant in the hot and rainy months. The bias towards merchant morbidity parallels the bias towards clergy morbidity in medieval Europe. Women and children suffered more simply because they stayed more at home.

Although nowhere near the 'Black Death' level of 1348–1350, official mortality figures were nevertheless gross underestimates. Total plague mortality in the seven severely affected thanas was possibly in the range of one quarter of a million in the period 1900–1924. The affected thanas lost some 20 per cent of their population over two decades.

For the western world, bubonic plague is a horrible disease tucked away in the Middle Ages. This collective historical memory is in sharp contrast to the popular ignorance that prevails regarding the etiology of the disease and the modes of transmission, reflected in the panic-stricken quarantine measures invoked against a suspected recrudescence of the disease in India a few years ago. It was forgotten that plague is a disease of rats, and not of humans, who cannot transmit the disease, and that quarantine can only increase mortality, as it did in the Middle Ages in Europe. The fact remains, however, that in several parts of the developing world,

[74] *Ibid.*, Nos 57 and 62, June 1909.

[75] *Ibid.*, Nos 3–4, June 1904; Nos 1–2, August 1905.

poverty and squalor set in dense human habitats and against a backdrop of rapid global environment change, continue to expose human populations to this medieval disease, as the recrudescence of the plague in western India recently revealed. Rodents are prolific creatures, and the plague therefore continues to be enzootic among rat populations. Fortuitous events can still spark epizootics, and consequently human epidemics, much the same way as these occurred in the medieval world. Indeed, modern means of transport can ensure that such epidemics would spread far more rapidly than the creeping medieval epizootics. It is probably public health measures, including the resolution of the complex etiology of the disease and the availability of effective drugs, which seems to be keeping the disease at bay. Despite the global scare the Surat phenomenon created, plague was stopped in its tracks, and the dreaded medieval scourge failed to recur.