

Epidemiological Context of China and Olympic Games

24 July 2008

Figure 1: Map of Chinese provinces and territories.



1. CONTEXT

With a population estimated at 1.33 billion people in 2008, China is the most populous country in the World. In 2006, an estimated 59% of the Chinese population lived in rural areas. China shares a border with Afghanistan, Bhutan, Burma, North Korea, India, Kazakhstan, Kyrgyzstan, Laos, Mongolia, Nepal, Pakistan, Russia, Tajikistan and Vietnam (Figure 1).

2. HEALTH SITUATION IN CHINA

Because of its size, its geographical position and its population, China is exposed to most health risks. The

health situation in China is extremely varied (between city and countryside, between coastal provinces and inland provinces). For instance, perinatal mortality rates are six times higher in the inland provinces than in the urbanized, coastal provinces

As in most countries in transition, China faces a significant increase in the health burden due to chronic diseases (cardiovascular disease, diabetes ...). The infectious diseases burden, however, remains comparable to that of developing countries both in terms of case-fatality rate (CFR) and incidence.

2.1. Non-Infectious Diseases

- With the improvement of living standards, chronic diseases are steadily rising and are now responsible for about 80% of deaths in China.
- A survey conducted in 2002 by the Chinese authorities estimated that :
 - 160 Million people were affected by arterial hypertension.
 - More than 260 Million people were overweight.
 - 20 Million were diabetic.
- Cancers are responsible for about 50% of deaths.
- With approximately 12,000 new vehicles put into service each day, traffic accidents are a major problem.
 - According to official sources, over 100 000 road-related deaths are reported each year.
 - According to other sources the number of yearly road-related deaths could be as high as 250 000, making the traffic accidents the leading cause of death among people aged 15 to 44 years.
 - An additional 500 000 people are injured every year on Chinese roads (Source: : WHO).
- The population is also exposed to significant environmental risks:
 - 16 Chinese cities are among the 20 most polluted cities in the World;
 - According to the Chinese authorities, 70% of rivers and lakes in China are polluted;
 - Each year, air pollution, contamination of water by industrial/urban wastes, excessive use of pesticides and insecticides are linked to almost 400,000 deaths (Source: : WHO).

2.2. Infectious diseases

- Despite substantial progress over the past 50 years, infectious diseases remain a major problem in China.
- It is estimated that over 850,000 children aged less than 5 die each year; over 70% of these deaths are due to respiratory and parasitic infections for which effective methods of prevention treatment exist (WHO).
- Acute respiratory tract infections remain the leading cause of morbidity (27%).
- Gastroenteritis represents 7.5% of all causes of morbidity (5% in urban areas versus more than 8% in rural areas) (Source: : WHO).
- The Notifiable Diseases (ND) system in China is based on the mandatory notification of 28 diseases. Information regarding representativity, completeness or case definitions is not available. These data should therefore be interpreted with caution.
- Official ND data nevertheless provide useful hints. The 2007 data (Source: China CDC) are presented in Table 1.
 - **Morbidity:** In terms of notification, the 5 leading causes were hepatitis including hepatitis B (1.3 million reported cases), tuberculosis (1.5 million cases), dysentery (amoebic and bacillary), syphilis and gonococci. In 2007, these 5 causes accounted for over 93% of ND.

- **Mortality:** The 5 leading causes of death were tuberculosis, viral hepatitis, rabies, AIDS and Japanese encephalitis. These 5 causes accounted for 92% of deaths notified in 2007.

2.2.1. Seasonal Influenza

- Due to the important climatic variations related to the size and geographical situation of the country, the epidemiology of seasonal influenza is highly contrasted between North and South of the country.
- In the North of the country (continental climate), peak transmission occurs during winter and spring (November to April).
- In southern China, Hong Kong Special Administrative Region (SAR) has an excellent surveillance system whose results can be extrapolated to the bordering regions of mainland China. Data from recent years (Source: [Centre for Health Protection](#), Hong Kong) show two peaks of transmission: the first occurs between January and April, the second occurs between July and August (see Figures 2 and 3).

Table 1: Mandatory Notifiable Diseases, 2007 China
(Source: Chinese CDC).

	Case	Death
Viral Hepatitis	1 603 060	1 098
Hepatitis B	1 327 225	838
Hepatitis C	100 258	123
Hepatitis D	79 349	23
Hepatitis A	20 513	39
Hepatitis undetermined	75 715	75
Tuberculosis	1 499 264	2 073
Dysentery (amoebic and bacillary)	371 598	68
Syphilis	220 561	74
Gonorrhoea	149 079	0
Measles	118 031	64
Malaria	47 468	14
Scarlet Fever	34 170	0
Brucellosis	21 560	0
Typhoid et paratyphoid Fevers	21 254	7
Haemorrhagic Fever (hantavirus)	11 756	129
Aids	7 803	1 200
Japanese Encephalitis	4 660	165
Rabies	3 399	2 873
Schistosomiasis	3 200	1
Whooping cough	3 031	0
Neonatal Tetanus	2 202	160
Meningococcal Meningitis	1 288	104
Leptospirosis	914	31
Dengue	544	0
Anthrax	431	1
Cholera	164	0
Avian influenza	5	2
Plague	2	1
Diphtheria	1	0
Poliomyelitis	0	0
Flu	-	-
Sars	0	0
Total	4 125 444	8 065

Figure 2: Influenza virus - Biological confirmations (Laboratory Surveillance System), Hong Kong SAR, 2006-2007 (Source: [Centre for Health Protection](#)).

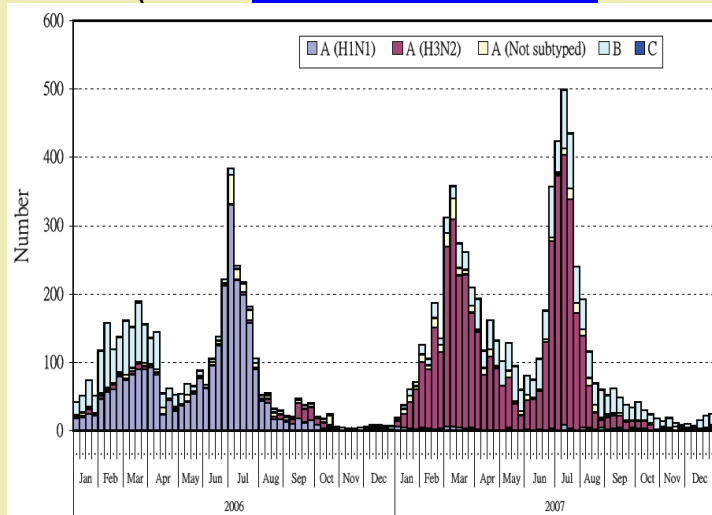
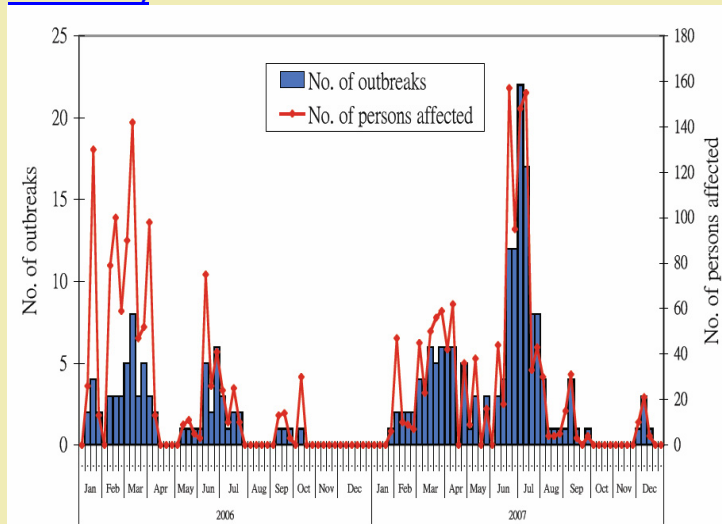


Figure 3: Seasonal influenza outbreaks, Hong Kong SAR (DOH), 2006-2007 (Source: [Centre for Health Protection](#)).



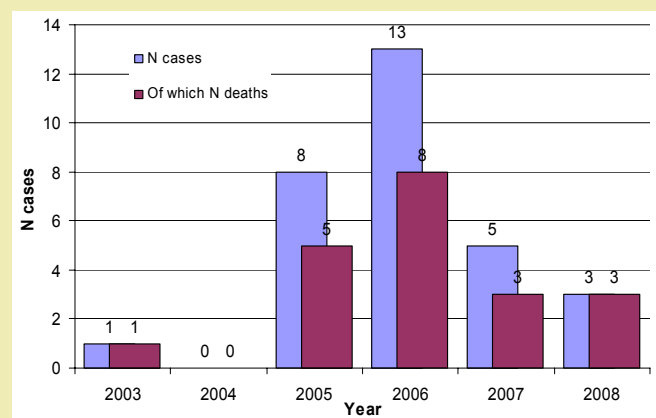
2.2.2. A(H5N1) Influenza

- New flu viruses are known to have emerged from China, including strains responsible for pandemics in the past. China is among the countries affected by the epidemic of influenza A (H5N1).
- Since the beginning of the epidemic in 2003, 22 of the 31 provinces of mainland China have reported epizootic outbreaks. In 2008, epizootic were officially reported in Guizhou, Tibet, Xinjiang, Guangdong and Hong Kong.
- There are no available and reliable veterinary surveillance data allowing an estimation of A (H5N1) virus circulation in China. In spite of the massive use of the avian vaccine, and in the absence of appropriate surveillance measures (unvaccinated sentinel chickens), low-level viral circulation in poultry cannot be ruled out in China.
- In addition, under-reporting of avian influenza outbreaks can not be formally excluded, particularly

in coastal provinces. Humans must therefore be considered at risk for A(H5N1) infection in case of close contact with birds throughout China.

- From November 2003 to May 15, 2008, a total of 30 biologically confirmed human cases of avian influenza A (H5N1) including 20 deaths were reported to WHO by mainland Chinese authorities. In 2008, 3 laboratory confirmed human cases were documented in the provinces of Hunan, Guangxi and Guangdong (see Figure 4).
- Since the onset of the outbreak, contact with sick or dead birds could be documented in less than 50% of confirmed human cases in China. However, this large proportion of human cases without documented contact should be analysed in the context of limited veterinary surveillance in China.
- An episode of human-to-human transmission within a family has been suspected in 2007 in Anhui ([Source: WHO](#)). However, this transmission remained limited and did not result in secondary community transmission. Virological studies confirmed that the strain isolated in the case showed no significant mutation.

Figure 4: Biologically confirmed A(H5N1) human cases, China, 2003-2008.



2.2.3. Tuberculosis

- TB is highly endemic in China, especially in rural areas.
- In 2006, the annual incidence was estimated at 99 cases per 100,000 and the prevalence at 200 cases / 100,000 people. The prevalence of HIV among new cases is about 0.3% (Source: : WHO). Nearly 1.5 million cases were officially reported in 2007.
- It is estimated that nearly 140,000 of these cases are caused by a multi-resistant strain. In 3 provinces, proportions of primary multi-resistance of around 9% were detected (Source: : WHO). These data are to be compared with the average prevalence (5.3%) of primary multi-resistance collected by WHO in 83 countries or administrative regions between 2002 and 2006.

2.2.4. Sexually transmitted diseases

Hepatitis

- Hepatitis is a major public health issue in China. In some provinces, 10% of the population is chronic carriers of the Hepatitis B virus.
- In 2007, over 1,327 000 Hepatitis B cases were notified (83% of all hepatitis cases reported in 2007).

HIV/AIDS

- According to available data, the overall HIV prevalence in China is low. It is estimated that about 650,000 people (less than 0.05% of the population) were living with HIV / AIDS in 2006 (between 390,000 and 1.1 million according to high or low estimates; source UNAIDS / WHO). These estimates are to be interpreted with caution. As in many other countries, these figures probably underestimate the real situation (see Figure 5 and Figure 6).
- According to UNAIDS, the prevalence is higher:
 - In some villages where many people were infected during paid blood donations (due to lack of compliance with basic hygiene precautions);
 - In some risk groups, particularly in urban areas: sex workers or men who have sex with men;
 - In some areas of Xinjiang: among drug addicts in whom HIV prevalence can reach 80%;
 - In 16 Chinese provinces, the prevalence is over 16% among drug users;
 - The number of HIV/AIDS cases is increasing in China. The risk of heterosexual transmission is currently exceeding that of injectable drug misuse as the main mode of HIV transmission.

Other STI

- Available data on STI are very fragmented. Both syphilis and gonococcal infection, however, are among the 5 leading infectious diseases reported in the ND system : 220,000 and 149,000 cases officially reported in 2007, respectively.

Figure 5: HIV seroprevalence among drug users en China, 1998-2000 (Source: [WHO](#))

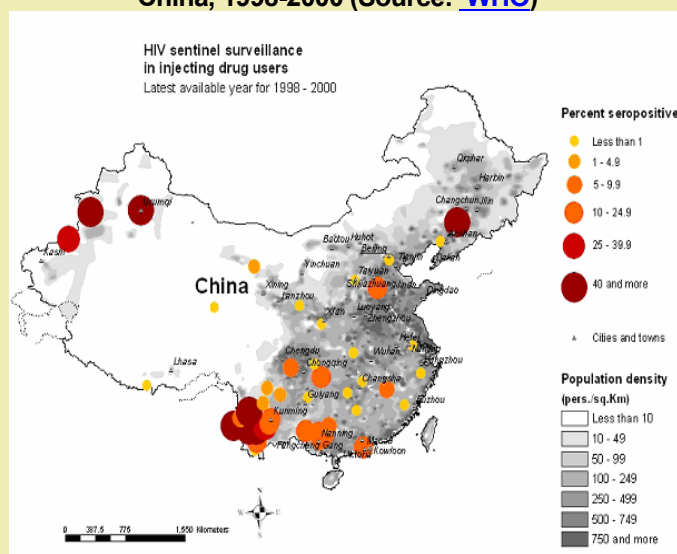


Figure 6 : HIV infection notified in China, 1985-2005 (Source: Wu Z. et al. Lancet. 2007; 369(9562):679-90).



2.2.5. Vector-borne diseases

- Vector-borne diseases are endemo-epidemic in several Southern rural provinces.

Japanese Encephalitis

- The virus is endemic in rural areas of Chinese provinces except in Tibet, Qinghai and Xinjiang (see Figure 7).
- Each year, between 8,000 and 10,000 Japanese encephalitis cases are identified in China, representing 65 % of world cases.
- These cases occur mainly in rural areas.
- In July and August 2006, however, outbreaks were reported in 3 urbanised provinces the Centre-East of China (Henan, Shanxi & Shaanxi, in red on Figure 8).

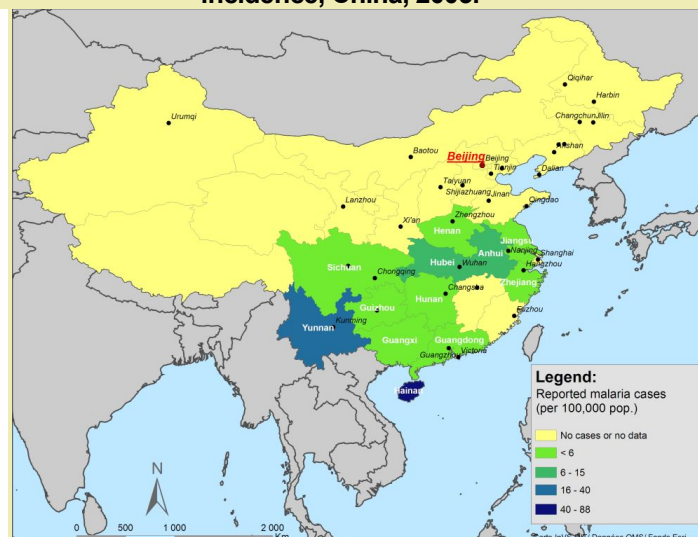
Figure 7: Japanese Encephalitis geographic distribution (Source: CDC Atlanta).



Figure 8 : Provinces affected by the urban JE outbreaks, China, 2006. (Source: : InVS-DIT)



Figure 9: Malaria circulation area and estimated incidence, China, 2003.



Malaria

- Malaria is endemic in rural areas of the southern part of the country, particularly on the island of Hainan, and in the provinces of Yunnan and Anhui (Source: WHO, cf. Table 1, Table 2 and Figure 9).
- In 2003, 88% of the 40,681 biologically confirmed cases of malaria were due to *P. vivax* (12% were related to an infection with *P. falciparum* alone or mixed infection). In 2003, 52 deaths from malaria were reported in China.
- *P. falciparum* circulating strains are characterised by a high resistance profile, especially in the south-west of the country (see Table 2 and Figure 9).

Table 2: Confirmed Malaria cases by province, 2000-2003, China, (Source: CDC China)

	2000	2001	2002	2003
Yunnan	8 775	8 709	12 218	15 431
Hainan	1 600	3 205	5 354	6 357
Anhui		1 732	5 999	8 025
Hubei		612	5 101	5 344
Henan		1 882	2 921	2 448
Jiangsu		663	686	638
Guizhou		461	713	577
Guangdong		649	403	246
Sichuan		435	443	289
Guangxi	53	370	392	337
Zhejiang		196	229	291
Hunan		215	313	180
Shanghai			131	
Chongqing			86	
Fujian			85	
Total	12428	21130	37076	42166

Dengue

- Dengue epidemics occur regularly in the South and South-East of China (including in urban areas). A national control programme has been implemented.
- A total of 544 cases were notified in 2007. This figure underestimates certainly the extent of dengue virus circulation. Most of these cases were reported in the provinces of Guangdong, Guangxi and Zhejiang.

Tick-Borne Encephalitis

- Tick-borne encephalitis (TBE) virus circulates in the North-East of the country (Figure 14).

2.2.6. Diseases transmitted via the faecal-oral route

Principal agents reported under the Notifiable Diseases system

- Among the diseases caused by food- and water-transmitted pathogens included in the mandatory reporting system, dysentery (bacterial and amoebic) is most frequently reported with over 372,000 cases notified in 2007, followed by Hepatitis A and typhoid/paratyphoid fever (22,000 cases)

Cholera

- Cholera is endemic in some provinces.
- The last major epidemic was reported in 1994 (Figure 10).
- In 2007, 164 cases were notified.

Other etiological agents

- Many other food-borne infections (bacterial, viral and parasitic) are not mandatorily notifiable. Very little information concerning those diseases is available

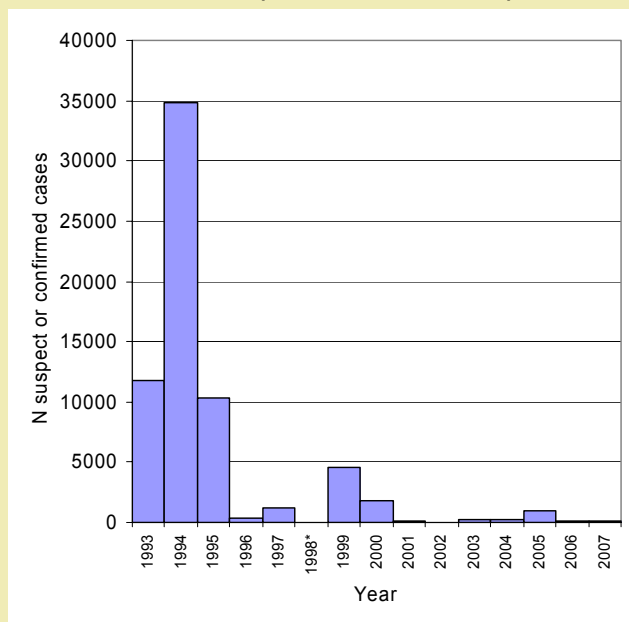
Food borne infections

- In 2005 (most recent available data) 32,553 cases (including 381 deaths) occurring in 2,453 clusters (Source: MoH) were notified.
- These figures seem very low with regards to population size, sanitary conditions and food safety in China. It can be assumed that no reliable information regarding food security is available.

Hand-Foot-Mouth Disease (HFMD) and enterovirus Ev71 infection

- HFMD and enterovirus EV71 are endemic in China.
- Between January 1 and May 31st, 2008, 176,321 HFMD cases (including approx. 40 deaths) were registered in China.
- For a more complete epidemiological description (see EV71, Eweb n°6, April 23–April 29, 2008).

Figure 10: Suspect or confirmed cholera cases, China 1993- 2007 (Source: CDC China).



2.2.7. Zoonoses

Animal bites (dogs, cats, monkeys...) are common in China. In 2006, 140,000 animal bites were reported in Beijing city only. Animal bites are a frequent cause of medical referral following in travellers returning from China¹.

Rabies

- Rabies has been on the rise over the past few years.
- In 2007, 3,399 cases (including 2,873 deaths) were notified.
- No cases were reported in the capital between 1994 and 2004. Rabies, however, has caused 7 deaths in the city of Beijing since August 2005.
- Dog vaccination campaigns are ongoing in Beijing.

Hantavirus Infections

- Haemorrhagic fever with renal syndrome (HFRS) caused by Hantavirus is a major public health problem, particularly in rural areas in the north of China.
- In 2002, 18,580 cases (107 deaths) were reported.

Brucellosis

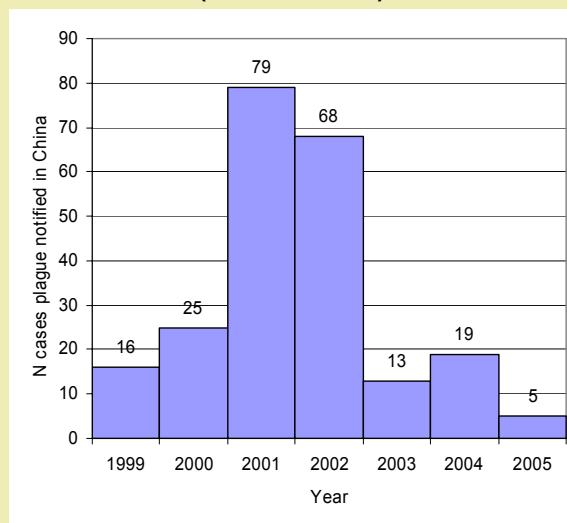
- Brucellosis is endemic in many regions. In 2007 nearly 22,000 human cases were reported.

Plague

- In the early twentieth century, major plague epidemics occurred in Northern China

- Some foci of transmission remain. Between 50 and 100 human cases are officially reported every year (2 cases in 2007) mainly among hunters (Figure 11 & Figure 15.).

Figure 11: Human plague cases, China, 2002 – 2005 (Source: WHO).



2.2.8. Vaccine-preventable diseases

- Reported immunisation coverage is generally high.
- In 2006, immunisation coverage at 1 year was 92% for tuberculosis and 93% for measles (Source: WHO).
- However, small outbreaks continue to occur regularly. For example, in 2007 were reported:
 - 118,000 measles cases
 - 2,200 neonatal tetanus cases
 - 1,288 meningococcal meningitis cases (serotype not available)

3. 2008 BEIJING OLYMPIC GAMES

- Chinese authorities expect that approximately 500,000 foreign tourists will attend the Beijing Olympic Games (BOG).
- Schematically, three mains profiles can be defined for travellers attending the BOG. Depending on the destination, each profile is associated with different risks (Table 3).
- Olympic venues are located in seven Chinese cities: Beijing; Hong Kong; Tianjin; Shanghai; Shenyang; Qingdao and Qinhangdao.
- For people attending only sport events taking place in Beijing, health risks (providing an unpredictable major epidemic does not occur) are relatively limited, partly due to the absence of vector-borne disease transmission. Remaining risks (mainly food-borne infections, STI, road accidents, heat stroke / dehydration) do not differ from potential risks incurred by any tourist visiting Beijing at anytime.

¹ Xiaohong et al. Am. J. Trop. Med. Hyg., 79(1), 2008: pp. 4-8

Figure 12 – Average maximum temperature, Beijing, Shanghai and Hong Kong

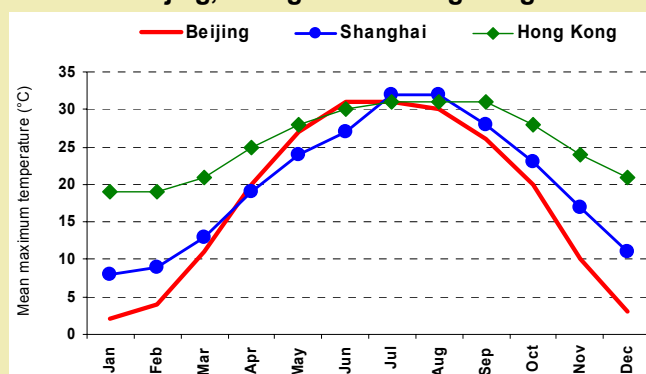
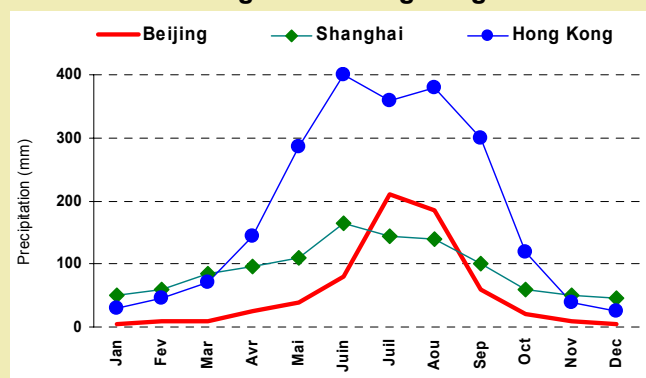


Figure 13 – Average monthly precipitation, Beijing, Shanghai and Hong Kong



- Consequences of heat and dehydration must be taken into consideration. BOG competitions will take place from August 8 to 24, 2008 and Paralympic Games will take place between 6 and 17 September 2008.
- Temperatures during this period are the highest of the year, with mean maximum temperatures higher than 30°C in the principal BOG competition venues.
- Some of the tourists attending the BOG will probably visit other provinces than Beijing, either to attend competitions in other venues or for tourism. These persons could be exposed to different risks. These risks could be those which prevail in the South of China (including Hong Kong) or linked to travel in rural areas (malaria, dengue, Japanese encephalitis, higher risk of exposure to rabies, etc.) There again, exposure for these travellers does not significantly differ from that of persons visiting touristy areas of China each year.

4. COMMENTS

Morbidity and mortality in China is now mainly linked to non-communicable diseases. However, risks due to communicable diseases remain.

Most tourists - especially those who will visit China to attend the Olympic Games – will visit and stay in urban centres of the northern part of the country. Based on currently available data, these risks should not be higher than those faced by tourists visiting these areas each year.

Table 3: Schematic presentation of infectious diseases health risks faced by tourists attending the Olympic Games in China, 2008.

	Beijing & surroundings	Other cities*	Rural Area
Foodborne diseases	++	++	+++
Sexually transmitted Infections (Figure 6)	++	++	+
Respiratory diseases linked to air pollution	++	++	-
Seasonal flu	+/-	++	+/-
Avian influenza (if contact with birds or wet market visits)	+	+	++
Dengue	-	+	++
Malaria (Figure 9)	-	-	+
Japanese Encephalitis (Figure 7)	-	-	+
Rabies	+	+/-	++

* Other cities with Olympic Game venues: Guangzhou, Hong Kong, Shanghai, Qingdao.

Figure 14: World distribution of Tick-borne encephalitis viruses.
(Source: : Rendi-Wagner P. J Travel Med. 2004 Sep-Oct;11(5):307-12.).

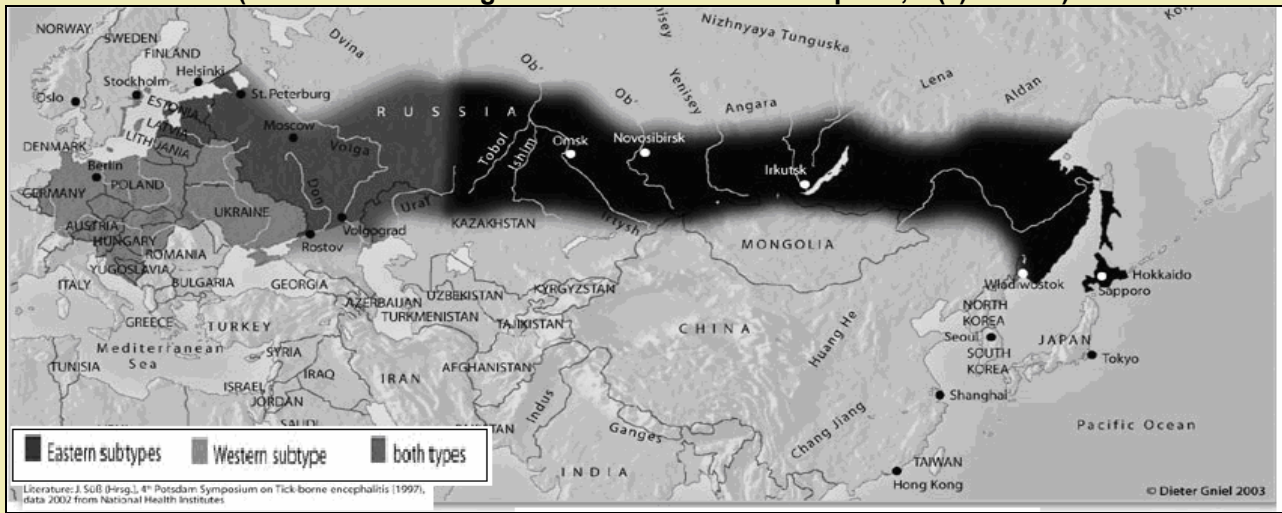


Figure 15: Geographical location of plague foci in Asia, 2002 – 2007 (data source WHO).

