Myths and Reality:
The context of emerging pathogens in China

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America's first images of China in the early 20th century were as the 'sick man of Asia'[1]. In 1948, the UN Relief Organization stated, "China presents perhaps the greatest and most intractable public health problem of any nation in the world." Two decades later, the dominant image of Mao's China was one of healthy, red-cheeked babies born to a nation that seemingly provided health care for all[2]. The real story is more complex than either of these images, but in a country as vast and varied as China, many realities are true. The recent spread of HIV/AIDS and now the SARS epidemic have placed enormous stress on the Chinese health care system, as would be the case for any health care system. To effectively assist the Chinese response to SARS, we must understand the forces that have shaped this system. This requires a small excursion in history, past and recent, to revisit remarkable achievements and the factors that have determined the current system's strengths and weaknesses.

What will the history tell us? 1) Public health, which includes disease surveillance, health education, environmental sanitation, nutrition and food hygiene, and maternal and child health, is not a money-making operation. The trends in China's recent history demonstrate that public health agendas require strong government support and resources; it is easier to accomplish them when market forces are held at bay—or at least not in direct competition. 2) China's current curative health care system, of hospitals and clinics, has been shaped by economic incentives in the post-Mao era that have encouraged the development of hospital-based high technology medical care. In concert with the move away from collective welfare and central administration, inequalities in access to services have increased. But the infrastructure remains and can be supported and strengthened by forces within and outside of China. 3) Infectious diseases often strike hardest at the most vulnerable groups, those with least access to governmental safety nets. This was true for HIV in China—and in all nations—and the fear with SARS is that weaknesses in the rural health system, particularly in remote areas, will make containing the disease much more difficult. Newspaper reports about poor quality hospitals or farmers who cannot pay for needed medical care tell an important side of the story, but focus attention away from other critical components. 4) If we are to effectively assist China's response to SARS, we must understand the sensitivity for any government of double threats to public health and the economy, and reject the accusatory rhetoric that has characterized much of the editorializing of recent reports. Instead, we must recognize and build on the work of responsible, dedicated professionals in China and the US, people who are best positioned to develop strategies to contain SARS and prevent the emergence of other deadly pathogens.

Public health was probably Mao's biggest triumph. Under his leadership (1949-1976), China experienced the most successful large-scale health transition in human history -- a near doubling of life expectancy (from 35 to 68), the eradication of many endemic and epidemic infectious diseases, including illicit drug

use, prostitution and sexually transmitted diseases[3], that resulted in a gradual shift in the leading causes of death from infectious disease to chronic conditions[4]. This was not accomplished through great gains in per capita income, but rather by creating a closed socialist political economy that exercised control over industry, agriculture, and migration; redistributed income and wealth; and had the ability to set national and local priorities in health care. By focusing on broad distribution of resources and reliance on low-tech public health measures and "patriotic public health campaigns" that mobilized the population against environmental and behavioral risk factors, achievements were made in sanitation, maternal and child health, infectious disease surveillance, and vaccination; and China's three-tiered primary health care system became the WHO model for developing countries.[5] Most citizens had medical insurance through rural cooperative programs or urban workplace programs, although the level of coverage, quality of services, and overall health status indicators were never equivalent between rural and urban locations[6].

After Mao's death, the market-oriented economic reforms of the 1980s and 90s transformed the nation once again. Incomes and productivity rose dramatically as agriculture and then industry were de-collectivized, and there was a general loosening of administrative authority over lower level units. Living conditions, diet, and health and nutrition outcomes all improved steadily[7]. This was in contrast to the Soviet Union where life expectancy actually declined, from 70 in 1986 to 64 in 1994, and has continued to decline thereafter. Major investments were made in urban medical services, long stagnant under Mao, as China turned to the West to help modernize its hospitals, technology, pharmaceuticals, and medical research and training; and these changes had a positive impact on health status as well[8]. In part, these were responses to the increase in chronic diseases, for which modern medicine had developed expensive, intensive interventions—conditions like heart disease, stroke, and cancer—which were all increasingly prevalent. In part, however, as World Bank and Chinese public health researchers have clearly documented[9], the economic reforms created irrational incentives for hospitals to emphasize new technology and drugs because, as the government funded a smaller and smaller proportion of hospital budgets, profits on their use provided much needed revenue. In some cases, these reforms forced inefficient and poor quality hospitals to offer better services; in others, especially for the lowest level township hospitals in poorer rural areas, they have produced failing hospitals with little to replace them.

Public heath programs that did not generate profits suffered under the transition to a market-oriented system as well, with implications for health outcomes. For example, during the mid-1980s, funding for childhood immunizations in rural areas declined, which produced an increase in childhood infectious diseases. The government response, with assistance from the UNICEF, reversed this trend. My own research in a Shandong county public health department in 1990[10], and surveys of rural health services in eight provinces during the 1990s[11], document that collective benefits and funding for public health varied with the wealth of the region, but the hierarchy of medical and public health supervision continued to extend to clinics in villages and county towns. The top-down mobilization style of health education and prevention work was still effective against outbreaks of infectious diseases for which standard protocols existed (such as epidemic hemorrhagic fever, or Hanta virus); however, it was less capable of responding to new and more complex challenges such as risk factors for chronic conditions like hypertension which were not routinely screened. As many have observed, increased financial and administrative independence of local health institutions also undercut the ability of the central government to mobilize public health activities. This was demonstrated by the national-provincial conflict over response to the HIV epidemic, especially in areas with HIV-infected commercial plasma donors. This decentralization of authority and shift in concentration of resources from rural to urban areas, and from public health to curative medicine, has direct consequences for China's response to the SARS epidemic.

Two economic trends thus characterize China during the reform period: 1) increase in aggregate income levels, and 2) increase in disparities in income distribution (income inequality in China now equals that of the US[12]). In any economic system, both trends are related—and in complex and sometimes

contradictory ways—to health outcomes[13]. On the one hand, increased income and wealth produce improved health outcomes. China's impressive gains in per capita income in the post-Mao era, and especially in the last decade, are correlated with improvements in many health status indicators: during the 1990s, overall mortality rates declined in both urban and rural areas[14]; between 1991 and 2000, infant morality dropped significantly, from 17.3 to 11.8 per 1000 live births per year in urban areas, and from 58.0 to 37.7 in rural areas; and maternal mortality rates declined as well, in rural areas between 1991 and 2000 from 100.0 to 69.6 per 100,000 women per year, and in urban areas, from 46.3 to 29.3.

On the other hand, inequality in income distribution is linked to unequal access to care and consequently to disparities in health status. Urban-rural health disparities are evident in the mortality figures cited above, although the gap is declining for infant mortality[15]. Such highly aggregated health status measures often mask significant differences between geographic and sub-population income groups,[16] however, and this is certainly true for China's border and minority regions where mortality rates are much higher. In addition to income and geographic location, the strongest predictor of access to health care is having medical insurance. In urban areas the percent with employment-based coverage declined between 1993 and 1998, from 68.4% to 53.3%; but the rural insurance programs that depended on the collective economy for funding collapsed almost entirely in the 1980s, and by 1998, only 8.8% of the rural population had coverage.[17] Initially, because medical care charges had been kept below cost through price controls, loss of insurance did not create widespread hardships. However, as medical services improved and charges rose steeply during the 1990s, paying for medical care became increasingly burdensome to the poorest citizens[18]. Data from surveys during the 1990s document a decline in rural, compared to urban, inpatient admissions[19], and anecdotal reports suggest that many do not seek care due to the financial burden. During the 1990s, one of the most researched topics in health care in China was reform of health insurance, and pilot insurance programs were initiated in a number of urban and rural areas.[20]

In a developing country with 1.3 billion people, it is not surprising that remote rural areas in China lack resources to respond to HIV or SARS. Yet, one positive development appeared in 2002, prior to the SARS outbreak, to address these well-recognized inequalities. A program to rebuild rural health infrastructure, based on multi-ministerial coordination, was initiated. It includes: 1) reconstituting rural cooperative insurance to cover 900 million farmers through a joint funding mechanism, with direct investment from central, provincial and local governments and from the farmers themselves; and 2) re-establishing rural township public health hospitals to implement and oversee public health activities at the township and village levels that had become "unfunded mandates" during the reform era. If implemented, these initiatives will have a positive impact on public health and disease prevention in the long term[21], and the current dual challenges of HIV/AIDS and SARS add impetus to seeing that these programs are actually carried out. In the meantime, the government has established a special fund for those without insurance who seek treatment for symptoms of SARS.

Despite these measures, public health experts believe that China urgently needs international assistance in such areas as health surveillance, prevention, and control of communicable diseases. This is a role that the US is well positioned to fill. The CDC and NIH have added personnel and funded projects in China, but, compared to other nations, the US could be contributing much more.

In assessing the Chinese response to SARS, we are advised to turn to the lessons of AIDS for guidance[22]. Not surprisingly, the media has tended to highlight China's weaknesses in dealing with AIDS, particularly inaction in the face of HIV infection of commercial blood plasma donors during the 1990s in a number of provinces, as reported in the *New York Times* in late 2001. While I do not minimize the gravity of this part of the epidemic or the negative consequences of delay, these images distort appreciation of the strengths of the Chinese response, strengths that must be recognized and reinforced for

the current system to respond effectively to SARS. For example, evidence that the epidemic was spreading to plasma donors was actually reported in the international and Chinese medical literature as early as 1995,[23] and in 1996, at the International AIDS meeting in Vancouver[24]. By the time of the first international AIDS conference in Beijing, in 2001, detailed epidemiology was being conducted and reported[25]. During this same time period, the daunting difficulties involved in protecting China's blood supply were documented in a number of publications. These included cultural barriers to an all-volunteer blood donation system, shortage of clinical transfusion specialists, and the high cost of technology required for accurate testing for transfusion-transmissible diseases such as hepatitis and HIV.[26] Efforts to improve the safety of the blood supply have been ongoing and increasingly successful; and in 2002, the Chinese Ministry of Health had publicly outlined a plan to include AIDS comprehensive prevention and care programs for plasma donors and other risk groups in 100 counties identified as hardest hit by AIDS.[27] These are extremely important developments, and deserve media attention as well as international support.

We excoriate the Chinese government for allowing the epidemic to spread through hundreds of poor villages. But we should ask how well other countries with far greater resources have performed? And we must also ask whether we apply a double standard to developing countries when it comes to public health performance[28]. In fact, few governments, rich or poor, have successfully stemmed the spread of AIDS. In my view, the use of public health challenges as shorthand political critiques is a real danger as we move forward to combat a global threat. If China applied the same shorthand to characterize the US health care system—a system that spends more than any other nation on medical care—and its capacity to respond to crises, what would we be reading? That African Americans are ten times as likely to die from HIV as whites, a statistic that reflects the disgraceful fact that disparities in morbidity and mortality between blacks and whites are actually greater now than in 1950? That the CDC responded rapidly to protect US senators from anthrax, while failing to extend that same response to US postal workers? In the rush to judgment on SARS we should also remember that the Chinese public health system has proven that it **can** respond to potential threats with speed and decisiveness: in December 1997, fearing an outbreak of a deadly strain of avian flu, the Chinese decided in one day to slaughter 1.2 million chickens from 160 farms and from more than 1,000 retailers and stalls.[29] How many other governments would have had the political will to take such action?

If response to SARS is compared to response to AIDS, we must examine all components of the response. We need to recognize that funding from the US and other donors for biomedical and scientific collaborations is having an important impact on HIV prevention and treatment. Awarding a $15 million NIH Comprehensive International Program of Research on AIDS (CIPRA) grant to the China CDC in summer 2002 did not garner much media attention, but it provided funds for vaccine development, research on risk factors and behavioral interventions, and treatment trials that are all moving forward. Other US and international organizations have contributed to research efforts, including the CDC, World Bank, DFID, UNAIDS, UNICEF, AUSAID, WHO, Ford Foundation, USAID, and the Gates Foundation. An additional consequence of these collaborations is increased attention to and training for researchers and communities on the ethics of humans subjects protections in clinical research[30]. Perhaps most important, clinical research also has the potential to focus attention on unmet treatment needs, as occurred after the first International AIDS meeting held in Africa, in 2000, when the magnitude of HIV among Africans became suddenly so salient that the world could no longer ignore the double standard of access to drugs only in developed countries. While many factors influenced China's decision to establish AIDS prevention and treatment services in the 100 highest prevalence counties, it was initiated after a major Sino-US conference, in November 2002, on AIDS research and training in Beijing.

Statistics on disease and death rates are often used like Rorschach tests to measure the legitimacy of a government. Infectious diseases, including emerging pathogens like HIV and SARS, are particularly

potent foci for such critiques, in part because they tend to fall hardest on the most vulnerable and least well served by society. In fact, as Paul Farmer, a Harvard physician and anthropologist who has written extensively about AIDS in Haiti, argues, "inequality itself constitutes our modern plague."[31] It is not clear how large the SARS epidemic in China will be or how long it will last. What **is** clear is that the outbreak has alerted China and the world to the relationship between infections and inequalities, and the peril to all of us if we ignore that relationship.

The spread of these emerging pathogens in China and elsewhere is a direct, if unintended, consequence of economic reform and integration of China into the global community. These are reforms that the US has encouraged and in which the business and scientific communities have played key roles. Helping to enhance the strengths of China's public heath system instead of focusing on its failures will reinforce needed reforms that in some cases are already underway. We must credit China's current efforts to contain the epidemic in its hospitals, cities and borders, and openness to international collaboration and information sharing for what they are—contributions to the global efforts to control this deadly disease, and prevent an epidemic from becoming a pandemic.

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[1] J Horn, *Away with All Pests: An English Surgeon in the People's Republic of China* (New York: Monthly Review Press, 1969); GE Henderson, "Public Health in China," in WA Joseph (ed), *China Briefing* 1992 (Boulder: Westview Press, 1992).

[2] V Sidel, *Serve the People: Observations on Medicine in the People's Republic of China* (Boston: Beacon Press, 1974)

[3] MS Cohen, GE Henderson, P Aiello, Zheng HY, "Successful Eradication of Sexually Transmitted Diseases in the People's Republic of China: Implications for the 21st Century," *Journal of Infectious Disease* 1996; 174 (Supplement 2): S223-230.

[4] WC Hsiao, "Transformation of Health Care in China," N*ew England Journal of Medicine* 310:932-6, 1984; GE Henderson, "Issues in the Modernization of Medicine in China," in D Simon and M Goldman (ed) *Science and Technology in Post-Mao China* (Cambridge: Harvard University Press, 1989); see also World Bank reports on China's health sector (1984 and 1989).

[5] RJ Blendon, "Can China's Health Care Be Transplanted Without China's Economic Policies?" *New England Journal of Medicine* 300: 1453-58, 1979.

[6] GE Henderson et al., "Distribution of Medical Insurance in China," *Social Science and Medicine* 41,8: 119-30.

[7] See appended tables from *Zhongguo Weisheng Nianjian* (China Health Yearbook) 2001 (Beijing: People's Medical Publishing House, 2001) reporting 2000 mortality rates and leading causes of death. See BM Popkin et al., "Trends in diet, nutritional status and diet-related non-communicable diseases in China and India: The economic costs of the nutrition transition." *Nutrition Reviews* 59: 379-90, 2001, demonstrating the decline in malnutrition across rural China during the 1990s and rise in non-communicable disease.

[8] GE Henderson et al., "High Technology Medicine in China: The Case of Chronic Renal Failure and Hemodialysis," *New England Journal of Medicine* 318,15:1000-4, 1988.

[9] *China 2020 series: Financing the Health Sector* (Washington DC: World Bank, 1997)

[10] GE Henderson and TS Stroup, "Preventive Health Care in Zouping: Privatization and the Public Good," In A Walder (ed), *Zouping in Transition: The Political Economy of Growth in a North China County*. (Cambridge: Harvard University, 1998)

[11] China Health and Nutrition Survey (funded by NIH, NSF, Foundation, UNC, and Chinese Academy of Preventive Medicine), conducted in 1989, 1991, 1993, 1997, and 2000.

[12] The World Bank reports the inequality index (Gini coefficient) for both countries in 1997 at about 40. Gini measures income distribution on a scale of 1-100. A rating of "1" would mean that that income is perfectly equally distributed, with all people receiving exactly the same income; "100" would mean that one person receives all the income. European countries' Gini coefficients ranged in the 20s and 30s; the highest were Brazil, South Africa, and Guatemala, at around 60.

[13] Moreover, extent of inequality itself seems to be related to poorer health care access and outcomes.

[14] Jun Gao et al., 2002, p. 22.

[15] *Zhongguo Weisheng Nianjian* (China Health Yearbook) 2001. (Beijing: People's Medical Publishing House, 2001) The comparable US figures are not too dissimilar: in 1997, IMR for whites was 6.0; for blacks it was 13.7, a greater than two-fold difference (CDC NCHS website).

[16] Liu YL WC Hsiao, and K Eggleston., 1999, p 1350.

[17] Jun Gao et al., 2002 p. 26.

[18] Liu Yuanli, WC Hsiao, and K Eggleston, "Equity in Health and Health Care: The Chinese Experience," Social Science and Medicine 49,10:1349-56, 1999; GE Henderson et al., "Trends in Health Services Utilization in Eight Provinces of China, 1989-1993," *Social Science and Medicine* 47,12:1957-71; Jun Gao et al., "Health Equity in Transition from Planned to Market Economy in China," *Health Policy and Planning* 17 (Suppl 1):20-29, 2002

[19] Jun Gao et al., 2002, p. 26.

[20] GG Liu et al., "Equity in Health Care Access: Assessing the Urban Health Insurance Reform in China," *Social Science and Medicine* 55,10:1779-94; G Bloom and Tang SL, "Rural Health Prepayment Schemes in China: Towards a More Active Role for Government," *Social Science and Medicine* 48,7:951-60; G Carrin et al., "The Reform of the Rural Cooperative Medical System in the People's Republic of China: Interim Experience in 14 Pilot Counties," *Social Science and Medicine* 48,7:961-72.

[21] Personal communication with Dr. Yiming Shao, Chinese Center for Disease Control and Prevention

[22] LK Altman, "Lessons of AIDS, Applied to SARS," *New York Times* May 6, 2003 D1

[23] Ji Y, Qu D, Jia G, et al. "Study of HIV Antibody Screening for Blood Donors by a Pooling Serum Method," *Vox Sang* 1995, 9:255-6. Wu Zunyou et al., "HIV-1 infection in commercial plasma donors in China," *The Lancet* 1995 Jul 1;346(8966):61-2. Lancet is the premier British Medical journal. This first report featured a mother and her two daughters who tested positive, in the absence of any other risk factors except commercial blood donation, in rural Anhui Province, between February and March 1995. The authors state, "Notification of HIV-1 infection to infected persons or their family members is not routinely done in China. Niether these infected women nor their family members were informed of the infection because it was feared that they would commit suicide if they discovred they were infected with HIV-1." The authors recommended screening plasma products and donors, disclosing HIV status to infected individuals, and introducing surveillance of plasma donors. Other articles about HIV in plasma donors include: Ji Y et al., "An Antibody Positive Plasma Donor Detected at the Early Stage of HIV Infection in China," *Transfusion Medicine* 6,3:291-2, 1996; VR Nerurkar et al., "Complete Nef Gene Sequence of

HIV Type 1 Subtype B' from Professional Plasma Donors in the People's Republic of China," *AIDS Res Hum Retroviruses* 14,5:461-4, 1998; and Zheng X et al. (China CDC), "The Epidemiological Study of HIV Infection Among Paid Blood Donors in One County of China," *Zhonghua Liu Xing Bing Xue Za Zhi* (China Journal of Epidemiology) 21,4:253-55, 2000.

[24] Dr. Yiming Shao, a virologist from the Chinese CDC, presented data at this conference.

[25] Before 2000, epidemiology was published in Chinese journals, e.g., Ye DQ, et al., "Serological epidemiology of blood donors in Hefei, Anhui Province," *Chinese Journal of Public Health* 17:367-8, 1998; and in 2001, in the West, e.g., Wu ZY, Rou KM, and R Detels, "Prevalence of HIV Infection Among Former Commercial Plasma Donors in Rural Eastern China," *Health Policy and Planning* 16,1:41-46, 2001

[26] Hua Shan, Wang J, Ren F, et al., "Blood Banking in China," *The Lancet* 360:1770-5, 2002.

[27] "AIDS Comprehensive Prevention and Treatment Demonstration Sites," China MOPH, 2003.

[28] For example, what was our response when Nelson Mandela failed to arrest the spread of HIV in South Africa, when under his watch, the prevalence of HIV in antenatal clinics rose from under 1% to near 30%?

[29] G Kolata, *Flu: The Story of the Great Influenza Pandemic of 1918 and the Search for the Virus that Caused It* (NY: Simon and Schuster, 1999) p. 239. In fact, it was suspicion that SARS was actually avian flu that delayed response in some locations.

[30] Research ethics training programs have been carried out at the China CDC AIDS Center during 2002 and 2003, sponsored by NIH Fogarty International Center AIDS International Training in Research and Prevention Program, at both UCLA and UNC, and the NIH Office of AIDS Research.

[31] P Farmer, *Infections and Inequalities: The Modern Plague*. (Berkeley: UC Press, 1999).