Explaining the HIV prevalence of international traveler population in China, 2005-2012

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ABSTRACT

Explaining of HIV surveillance data (2005-2012) on international travelers from Chinese ports of entry indicated that a significant downward trend of HIV prevalence was observed from 2006 through 2010 among the international immigrants. Moreover, this data reflected HIV prevalence among a specific and clear subpopulation of people defined as unknown HIV status population.

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Introduction

Data and methods for estimating the prevalence of HIV within countries have improved over the past few years \[^1\]. For antenatal clinic sentinel surveillance, many countries have added further sentinel sites to their surveillance systems. For HIV serosurveillance among high-risk groups, many countries have changed sampling methods over time. These changes have resulted in improved evaluation of HIV prevalence, but make it difficult to predict trends of HIV prevalence. Is prevalence increasing, decreasing, or being stable? The degree of certainty largely depends on the population of interest.

In the 1980s, China established a laboratory-based HIV surveillance and notification system on specific international travelers at ports of entry (PoE). A web-based electronic records system was subsequently established in 2003 and expanded to include all Chinese Inspection and Quarantine institution (CIQ) laboratories in 2004. Similar to system of many other countries in the early days of the AIDS epidemic, the Chinese system focused on developing a network to provide complete surveillance coverage, and to link the data provided to the authorization of residence visa permits. The population tested in the CIQ system included: (1) aliens applying for visa permits for permanent residence or a long-term visit (1 year or longer) in China, and (2) Chinese residents applying for health certificates (including an HIV test), either voluntarily or as part of the requirements of their travel destination countries or areas \[^2-3\].

Here, we review the HIV surveillance data from 2005 to 2012 and describe the HIV prevalence among the above surveyed population. Epidemiological variation and trend analysis revealed that a time point may put a significant influence on the HIV positive incidence. Interestingly, the time point coincided with the official removal of a long-term policy that banned visas for international immigrants living with HIV/AIDS in China in April 2010.

Methods

1. National HIV surveillance system at Chinese PoE

Under the International Health Regulations, the official authority at PoE in China is the General Administration of Quality Supervision, Inspection, and Quarantine of the People’s Republic of China (AQSIQ). The AQSIQ is responsible for the prevention and control of infectious diseases throughout the country’s PoE. The CIQs are established by the AQSIQ at specific localities, where they set up network monitoring laboratories for infectious disease surveillance focused on international travelers and migrants (both entry and exit), and are responsible for carrying out quarantines, monitoring disease epidemiology, and issuing epidemic reports. They also carry...
out actions related to disease control at PoE.

CIQ laboratories implemented a standard-ized and centralized quality assurance program for HIV testing that has been in effect since the late 1990s. HIV testing followed WHO protocols for screening: two positive results from HIV enzyme immunoassays indicated preliminary positive status, two negative tests confirmed negative status, and a third immunoassay was used to confirm positive status\[^4\]. Upon confirmation that a person was living with HIV/AIDS, the information was immediately reported to the China Health Quarantine Information Management System (HQIMS), a web-based electronic records system established at the end of 2003.

2. Study Population

International travelers who underwent HIV testing at CIQ laboratories throughout China from January 2005 to December 2012 were recruited for our study. The demographic characteristics and HIV status of enrolled individuals were obtained via the HQIMS system.

International travelers were classified into two groups according to their place of origin\[^5\]: (1) international immigrants, including those aliens applying for visa permits for permanent residence or long-term visits (1 year or longer), generally receiving medical examination and HIV testing within a month after entry into China; and (2) Chinese emigrants, including Chinese applying for health certificates (including HIV testing), either voluntarily or to fulfill the requirements of their destination countries or areas. These travelers generally complete HIV testing before departure.

Annual HIV prevalence among international immigrants and Chinese emigrants was calculated annually by extrapolating the frequency of confirmed HIV-positive individuals among HIV-tested individuals that year. Trends in HIV prevalence were assessed subsequently. Speculating that the abolishment in April 2010 of the visa ban for aliens living with HIV/AIDS in China may influence the distribution of international immigrants applying for HIV testing, we distinguished HIV prevalence by time range (2005–2010 or 2010–2012) as well as residence of origin (international or domestic). To further assess differences in HIV prevalence, HIV-positive cases among international immigrants were geographically classified into six regions in accordance with WHO grouping of member states\[^6\]. This information was then used to further explore the epidemiology of HIV prevalence in these immigrants.

Results

From 2005 to 2012, HIV testing was performed for a total of 8,579,135 travelers (1,966,794 international immigrants and 6,612,341 Chinese emigrants) in the CIQ laboratories. The
prevalence of HIV was calculated as 0.106% (2,079/1,966,794) in the population of international immigrants, originating from 155 countries or areas, and 0.033% (2,160/6,612,341) in the population of Chinese emigrants. In the latter group, the dynamic of variation was smooth overall, although a slow increasing trend was seen from 2010 to 2012. The difference between HIV prevalence in 2005 compared with 2012 was significant (p<0.0001).

For the international immigrants, the prevalence of HIV was also significantly higher in 2005 than in 2012 (p<0.0001), with a sharp decrease in prevalence from 2006 through 2010. However, as with the Chinese emigrants, a tiny upward trend was evident in 2010 to 2012 (figure 1).

The HIV-positive international immigrants were then further classified according to WHO region of origin. As shown in Table 1, the subpopulation with the highest proportion of HIV positivity was from the Southeast Asian region, followed to a lesser degree by the Western Pacific region and then the African region. Residents from other regions accounted for only a small portion of the total HIV-positive immigrant population.

**Discussion**

International travel poses a risk of destination-specific illness and may contribute to the global spread of infectious diseases. These risks are even higher among immunocompromised people, such as HIV infection [7]. Despite this, little is known about the HIV prevalence characteristics of China international travelers.

Based on the complete coverage notification system of HIV surveillance of the specific travelers in China, we analyzed the overall HIV prevalence among the international migrants. The HIV prevalence in Chinese emigrants (0.033%) was significantly lower than that in international immigrants (0.106%) in most recent years (2005–2012). This is consistent with China’s low HIV prevalence status compared with other countries (less than 0.1 percent among adults). [8]

Although HIV prevalence changed significantly from 2005 to 2012 for both international immigrants and Chinese emigrants, prevalence in the former group displayed a nearly linear downtrend before 2010, while the latter group demonstrated a trend of relative stability over the same period. Then, the trend in both groups reached an apparent turning point in 2011.

The turning point attracts our attention and also drives us to do further sample composition analysis. Considering that no effective HIV vaccination measures are available to interrupt HIV transmission, and thus that HIV-uninfected persons still remain susceptible to HIV, it is reasonable for epidemiological purposes to define the group of persons who have not tested positive for HIV as the “unknown HIV...
Figure 1: Variation in HIV prevalence among the international travelers who entered into or exited from China during 2005 to 2012. HIV-positive/tested: number of HIV-positive individuals out of the total number of individuals tested. Round dots and diamonds represent prevalence; arrow indicates the time point in April 2010 when the visa ban on international immigrants living with HIV/AIDS was canceled.
Table 1. The geographic distribution of HIV-positive cases among international immigrants, according to WHO region of origin

<table>
<thead>
<tr>
<th>WHO region</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Total*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(n=2,079)</td>
</tr>
<tr>
<td>Southeast Asian Region</td>
<td>264</td>
<td>283</td>
<td>195</td>
<td>167</td>
<td>99</td>
<td>69</td>
<td>59</td>
<td>106</td>
<td>1242 (60%)</td>
</tr>
<tr>
<td>African Region</td>
<td>25</td>
<td>28</td>
<td>47</td>
<td>54</td>
<td>39</td>
<td>45</td>
<td>30</td>
<td>28</td>
<td>296 (14%)</td>
</tr>
<tr>
<td>Western Pacific Region</td>
<td>25</td>
<td>43</td>
<td>41</td>
<td>45</td>
<td>22</td>
<td>41</td>
<td>62</td>
<td>60</td>
<td>339 (16%)</td>
</tr>
<tr>
<td>European Region</td>
<td>8</td>
<td>9</td>
<td>12</td>
<td>16</td>
<td>15</td>
<td>14</td>
<td>14</td>
<td>17</td>
<td>105 (5%)</td>
</tr>
<tr>
<td>Region of the Americas</td>
<td>7</td>
<td>7</td>
<td>3</td>
<td>11</td>
<td>6</td>
<td>14</td>
<td>14</td>
<td>18</td>
<td>80 (4%)</td>
</tr>
<tr>
<td>Eastern Mediterranean Region</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>17 (1%)</td>
</tr>
</tbody>
</table>

*Percentages in parentheses represent percentage of the total population of international immigrants to China, from all six regions.

status” population. So, here we classified the general population as either "known HIV-positive population" (KHPP) or "unknown HIV status population" (UHSP). The KHPP comprises those who know their HIV status to be positive, while the UHSP comprises both those who are HIV-negative and know their status, and those who do not know their status. The data from 2005–2010 could provide a valuable UHSP for HIV prevalence analysis for two reasons. First, before April 2010, Chinese immigration authorities required international travelers to perform a health examination if applying for a residence permit, and people with confirmed HIV infection were not granted visas. Since this system involved complete coverage of international migrants, the KHPP would have been automatically excluded from health examinations for residence permits. Therefore, international migrants tested before April 2010 comprise individuals who are either HIV-uninfected or of unknown HIV status. Second, after April 2010, following the abolishment of the visa ban on residence permits, the KHPP could apply for long-term residence in China and their HIV status is incorporated into the HQIMS.
Further investigation by retracing epidemiological questionnaire in Beijing, Shanghai, and Sichuan CIQ (one, two, and one known HIV-infected cases were found in each of these three cities, respectively, in 2012) (unpublished data) also partly confirmed our hypothesis.

It can be deduced that the annual HIV incidence in the international immigrant population and the trend from 2005 to 2010 reflected the HIV prevalence in the UHSP: a significant downtrend from the peak (appearing in 2006, 0.159%) to the trough (2010, 0.070%) indicated that HIV prevalence among the UHSP decreased dramatically during this time. The cause of this decline in HIV prevalence among travelers entering China may be partly attributed to a growing number of applicants knowing their negative HIV status, along with the global expansion of HIV testing.

Despite this, the investigated sample represents the population who did not know their HIV status, and our data displays for the first time the dynamic of HIV prevalence among the UHSP, including those with unknown HIV status and those with known-negative HIV status. In addition, some advantages of our data are that the surveyed travelers covered a broad geographical area (155 countries or areas) and nearly no cases needing a health examination certificate were overlooked.

Travelers, who are defined as people journeying temporarily, permanently, or episodically for recreational or occupational reasons, or as forced or voluntary migrants, are key vectors for spreading sexually transmitted infections to unaffected regions \[^9\]. Our study provides useful data elucidating characteristics and trends in HIV prevalence among international travelers for 8 recent years in China. It also defines a specific and clear subpopulation that reflects HIV prevalence among the population with unknown HIV infection for the first time, which should be useful for the scientific evaluation of current national or worldwide HIV prevention policies and for predicting future trends in HIV infection.

**References**


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**Note:**