

Quantitatively monitoring AIDS policy implementation in China

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Background China has been scaling up its national AIDS programs since 2004. We tested a hypothesis that incrementally setting realistic quantitative targets for key indicators and monitoring performance would facilitate AIDS policy implementation in China.

Methods Core indicators monitoring the national AIDS program were developed, modified and used from 2007 through 2009. Targets of core indicators were set incrementally and monitored annually. Data were collected and reported from local counties in all 31 provinces of mainland China. Changes of core indicators from 2007 to 2009 were calculated and compared using Cochran–Armitage Trend tests.

Results The number of patients receiving free anti-retroviral treatment and methadone maintenance treatment increased from 41 777 to 81 739, from 97 554 to 241 975, respectively, between 2007 and 2009. The proportion of newly reported HIV/AIDS cases with a completed epidemiological investigation increased from 77.7% in 2007 to 91.1% in 2009 ($P < 0.0001$). The proportion of spouses of newly reported HIV/AIDS cases being tested for HIV increased from 24.7 to 63.4% ($P < 0.001$). Follow-up visits to people with HIV and AIDS increased from 32.8 and 34.0% in 2007 to 74.6 and 78.5% in 2009, respectively (both $P < 0.0001$). The proportion of CD4⁺ cell count monitoring for people with HIV and AIDS increased from 45.3 and 10.1% in 2007 to 54.2 and 62.5% in 2009, respectively (both $P < 0.001$). Viral load monitoring for AIDS patients receiving anti-retroviral treatment increased from 9.1 to 48.5% ($P < 0.001$).

Conclusions Setting targets for core indicators and monitoring performance has facilitated implementation of the national AIDS program in China.

Keywords AIDS program, implementation, indicators, quantitative evaluation

Introduction

China reported its first AIDS case in 1985,¹ and experienced a rapid increase in the number of cases of HIV/AIDS since 1995.² Since 2004, the Chinese government has put AIDS at the top of the public health agenda and has significantly increased financial support for implementation of the national HIV/AIDS programs.³⁻⁵ In 2006, specific targets were set to assess the impact and delivery of this increased government support.⁶ These included targets for increasing the level of HIV/AIDS knowledge among urban and rural residents to 75 and 65%, respectively, by 2007, and to 85 and 75%, respectively, by 2010; to ensure primary prevention measures reached 70% of high-risk groups by 2007 and 90% by 2010; and to ensure that free anti-retroviral treatment reached 50% of patients who needed it by 2007 and 80% by 2010.⁶

In order to promote and monitor the implementation of the national AIDS programs, the National Center for AIDS/STD Control and Prevention (NCAIDS) at the Chinese Center for Disease Control and Prevention (China CDC) piloted setting annual goals in 2006. The first two indicators used were to open 300 community-based methadone maintenance treatment clinics and to have enrolled at least 30 000 patients (cumulative) in the national free anti-retroviral treatment program by the end of 2006. Both these targets were achieved, which convinced authorities that setting such targets and collecting data from each site could effectively promote the national methadone and anti-retroviral treatment programs. Therefore, since 2007, the NCAIDS began to set annual targets to monitor the implementation of core elements of the national AIDS programs. Core indicators included HIV testing, epidemiological investigation for newly identified HIV/AIDS cases, follow-up visits for individuals infected with HIV/AIDS, monitoring CD4⁺ cell counts, condom promotion for high-risk groups such as female sex workers and men who have sex with men, the number of methadone clinics and the number of drug users served by the methadone program and the number of patients receiving anti-retroviral treatment. Program directors hypothesized that incrementally setting realistic quantitative targets and monitoring performance to hold implementers accountable would facilitate implementation of national AIDS program. This article provides a summary of how key indicators for monitoring implementation of the national AIDS program were developed and the results reported for 2007–09.

Methods

Selection of indicators

The first step in developing the quantitative monitoring system was selection of core indicators. Indicators

had to assess the national AIDS program's impact on the rate of HIV infection, primary prevention, treatment and care. Indicators had to be meaningful, pragmatic and able to objectively measure quality of implementation. Selection of core indicators for monitoring implementation was based on a systematic review of the framework for monitoring and evaluation China's national AIDS program,⁷ indicators used in UNGASS reporting,⁸ indicators used in Global Fund program⁹ and indicators used in assessing universal access.¹⁰ For pragmatism, meaningfulness and sustainability, the indicators selected and used were among those that could be directly retrieved from the existing data collection system, i.e. China's Comprehensive AIDS Data System, described in detail by Mao and colleagues in this issue.¹¹

Twelve core indicators were used in 2007 (Table 1), including: (i) proportion of newly reported HIV/AIDS cases being investigated epidemiologically; (ii) proportion of newly identified HIV/AIDS cases being reported in a timely manner via the Internet; (iii) proportion of people living with HIV (not including AIDS) who received regular visits by public health workers and intervention at least once a year; (iv) proportion of people living with HIV (not including AIDS) whose CD4⁺ cell counts were monitored at least once a year to determine if they needed ART; (v) the total number of patients who have received anti-retroviral treatment; (vi) the total number of patients currently receiving anti-retroviral treatment; (vii) the proportion of patients who survived for 12 months and remained in treatment after initiation of anti-retroviral treatment; (viii) the proportion of children with AIDS receiving anti-retroviral treatment; (ix) the total number of drug users who have received methadone maintenance treatment; (x) the total number of drug users currently receiving methadone maintenance treatment; (xi) the annual retention rate of drug users in methadone maintenance treatment; and (xii) proportion of sex workers receiving HIV/STD intervention measures, including condom promotion and sexual health education. Review of performance was conducted on an annual basis and feedback was collected for improvement. Core indicators used in 2007–09 are shown in Table 1. Twelve indicators were used in 2007, 19 in 2008 and 16 in 2009 and 10 indicators were used consistently from 2007 through 2009.

Between 2007 and 2009, few indicators were removed and a few were added:

- (i) timely case reporting via the Internet was used in 2007 and 2008 but not in 2009 since it reached 100% in 2008 and thus had no room to improve;
- (ii) the proportion of subjects who were screened as HIV positive and were notified and offered counselling was added in 2008 and removed in 2009, since data available for this indicator were from voluntary counselling and testing

Table 1 Selection of core indicators for monitoring AIDS policy implementation in China, 2007–2009

Core indicators	2007	2008	2009
Proportion of newly identified HIV/AIDS cases who have been investigated epidemiologically	✓	✓	✓
Proportion of newly identified HIV/AIDS cases being reported in a time manner via the Internet	✓	✓	–
Proportion of newly screened HIV-antibody-positive cases being notified and counselled based on first screening test result in a timely manner (not wait for confirmation)	–	✓	–
Proportion of people living with HIV (not including AIDS) who received regular visits by public health workers and intervention at least once per year	✓	✓	✓
Proportion of spouse/regular sex partners of newly reported HIV/AIDS cases tested for HIV antibody	–	✓	✓
Proportion of spouse/regular sex partners of previously reported HIV/AIDS cases tested for HIV antibody	–	✓	✓
Proportion of people living with AIDS who received regular visits by public health workers and intervention at least once	–	✓	✓
Proportion of people living with HIV (not AIDS) whose CD4 ⁺ cell counts were monitored at least once a year, to determine anti-retroviral therapy eligibility	✓	✓	✓
Proportion of patients receiving anti-retroviral treatment monitored for CD4 ⁺ cell count at least once a year to determine treatment effectiveness	–	✓	✓
Total number of the patients who have received anti-retroviral treatment	✓	✓	✓
Total number of the patients currently receiving anti-retroviral treatment	✓	✓	✓
Proportion of patients on anti-retroviral treatment who survived and remained in treatment for 12 months	✓	✓	✓
Proportion of children with AIDS receiving anti-retroviral treatment	✓	–	–
Proportion of patients receiving anti-retroviral treatment who have been monitored for viral load at least once a year to monitor treatment failure	–	✓	✓
Proportion of anti-retroviral treatment-naïve patients whose viral load has been inhibited during the first 6–12 months of treatment	–	✓	–
Total number of patients who have received methadone maintenance treatment	✓	✓	✓
Total number of patients currently receiving methadone maintenance treatment	✓	✓	✓
Annual retention rate of drug users in methadone maintenance treatment	✓	✓	✓
Proportion of sex workers receiving HIV/STD intervention measures	✓	✓	✓
Proportion of men who have sex with men receiving intervention measures	–	✓	✓

In the table, ✓ means the indicator was used in that year.

- (VCT) sites, which only accounted for about one-quarter of reported cases;
- (iii) the proportion of children with AIDS receiving anti-retroviral treatment was used in 2007 only and removed in 2008 and 2009 since there were already other indicators of treatment;
- (iv) the proportion of anti-retroviral treatment-naïve patients who had achieved viral suppression (viral load <1000 copies/ml) during the first 6–12 months of treatment was added in 2008 and removed in 2009 since the proportion of the patients receiving viral load testing is still rather low, so this indicator cannot reflect the real proportion of patients whose virus has been inhibited;
- (v) the HIV antibody-testing rate for the spouse/regular sex partner of people living with HIV/AIDS was added in 2008. In 2009, it was divided into rates for newly reported cases and existing cases. The purpose of this indicator was to help reduce secondary transmission of HIV by offering testing, regular visits by public health workers and providing referrals for other services;
- (vi) the proportion of men who have sex with men receiving intervention activities was added in 2008 and 2009, since the HIV infection rate in this group was steadily rising and has become a focus for the overall prevention of HIV/AIDS. The intervention activities included public health out-reach activities for safer sex counselling, condom promotion, HIV testing and other referral services.

Other important indicators for which data were collected included outreach intervention activities covering female sex workers per month and reaching men who have sex with men per month, and needle exchange program reaching injecting drug users. However, the interpretation of these data should be cautious because it is difficult to estimate the size of the target population.

Setting targets

Setting meaningful targets was very important and required the consideration of several factors. First, the 2006–10 5-year action plan had set targets for specific measures to be accomplished by 2007 and by 2010, respectively.⁶ Secondly, indicators needed to balance public health significance but had to be achievable. Targets were set based on previous year's performance and a reasonable incremental improvement. Specific quantitative targets selected are given in Table 2.

Accountability

Two strategies were used for accountability and for monitoring implementation. First, the directors of each technical division at the NCAIDS/China CDC were held accountable for indicators that fell within their portfolio. Each March, a contract was drawn containing specific indicators and targets for each division, which was signed by both the director of the NCAIDS and the directors of each division. At the end of December, an external review panel was invited to assess the performance of each division according to their targets. An annual performance evaluation meeting was held during which division directors reported on their progress for all relevant indicators.

Secondly, accountability for achieving each specific indicator was assigned to each local province. Each January, a national annual AIDS meeting has been held to review the past year's performance and to set new targets for the current year. Progress towards each indicator for each province is calculated and then ranked. Provinces that ranked in the top five were awarded a National AIDS Program Quality Performance medal. Provinces ranked at the bottom were reminded to work hard and to improve their performance in the following year.

Data collection and analysis

All original data were collected routinely by local implementers in 31 provinces and were entered into the Chinese Comprehensive HIV/AIDS Data Management System (a detailed description can be found in the article by Mao and colleagues, in this issue).¹¹ Data were retrieved from the database for 2007–09 and evaluated. Annual values of each core indicator were calculated and compared with set targets. The

Cochran–Armitage Trend Test was used to test if performances improved over time.

Results

Between 2007 and 2009, the availability of the national free anti-retroviral treatment program increased from 1190 counties to 1821. The cumulative number of AIDS patients who ever received free anti-retroviral treatment increased from 41 777 in 2007 to 58 795 in 2008 and to 81 739 in 2009, and the number of patients who remained in treatment increased from 32 849 in 2007 to 48 254 in 2008 and to 65 481 in 2009. The national methadone maintenance treatment program expanded from 503 clinics in 2007 to 600 clinics in 2008 and to 680 clinics in 2009. The cumulative number of drug users who had ever enrolled in the program increased from 97 554 in 2007 to 178 684 in 2008 and to 241 975 in 2009, and the number of drug users who remained in treatment increased from 61 557 in 2007 to 93 997 in 2008 and to 112 831 in 2009. The average number of drug users remaining in treatment per clinic increased from 122/clinic in 2007 to 156/clinic in 2008 and to 166/clinic in 2009. The number of needle exchange sites increased from 879 in 2008, to 962 in 2009, and the number of injecting drug users using the service monthly increased from 36 084 in 2008 to 39 075 in 2009. Monthly outreach intervention activities for female sex workers increased from 329 179 per month in 2008 to 418 975 per month in 2009. These activities reaching men who have sex with men increased from 49 062 per month in 2008 to 85 727 per month in 2009.

Core indicators used for monitoring implementation from 2007 through 2009 are presented in Table 2. The proportion of newly reported HIV/AIDS cases that had been investigated increased from 77.7% in 2007 to 91.1% in 2009 ($P < 0.001$). The proportion of spouses of newly reported HIV/AIDS being tested for HIV increased from 24.7% in 2007 to 63.4% in 2009 ($P < 0.001$). The proportion of spouses of previously reported HIV/AIDS cases who had not been tested or had tested negative being tested for HIV increased from 48.3% in 2007 to 53.5% in 2009 ($P < 0.001$). The follow-up rate for continuing services for people with HIV increased from 32.8% in 2007 to 74.6% in 2009, and the follow-up rate for continuing intervention services for AIDS patients increased from 34.0% in 2007 to 78.5% in 2009. The proportion of CD4⁺ cell-count monitoring for people with HIV increased from 45.3% in 2007 to 54.2% in 2009, and for people with AIDS increased from 10.1% in 2007 to 62.5% in 2009. The proportion of AIDS patients in the anti-retroviral treatment program who had their viral load monitored at least once per year increased from 9.1% in 2007 to 48.5% in 2009. The proportion of patients starting anti-retroviral treatment who

Table 2 Evaluation of core indicators used for monitoring AIDS policy implementation in China from 2007 through 2009

Indicators	2007		2008		2009		P-value
	Target	Achieved	Target	Achieved	Target	Achieved	
Proportion of newly reported HIV/AIDS cases who have been investigated epidemiologically (%)	70	77.7	75	81.1	75	91.1	<0.0001
Proportion of spouses/regular sex partners of newly reported HIV/AIDS cases tested for HIV antibody (%)	NT	24.7	50	55.1	60	63.4	<0.0001
Proportion of spouses/regular sex partners of previously reported HIV/AIDS (>1 year ago) cases tested for HIV antibody (%)	NT	48.3	50	45.4	50	53.5	0.02
Proportion of all people living with HIV (not AIDS) who have received regular visit by public health workers and intervention at least once a year (%)	50	32.8	70	55.7	70	74.6	<0.0001
Proportion of all people living with AIDS who have received regular visits by public health workers and intervention at least once a year (%)	NT	34.0	70	63.6	70	78.5	<.0001
Proportion of people living with HIV (not AIDS) who have had their CD4 ⁺ cell count monitored at least once a year to determine ART eligibility (%)	NT	45.3	50	48.4	50	54.2	<0.0001
Proportion of patients receiving anti-retroviral treatment monitored for CD4 ⁺ cell count at least once a year to determine treatment effectiveness (%)	NT	10.1	50	39.5	50	62.5	<0.0001
Total number of patients who have received anti-retroviral treatment	36 000	41 777	46 000	58 795	60 000	81 739	
Total number of patients currently receiving anti-retroviral treatment	28 800	32 498	36 800	48 254	48 000	65 481	
Proportion of patients on anti-retroviral treatment who survived and remained in treatment for 12 months (%)	80	83.6	80	84.4	80	82.3	>0.05
Proportion of patients receiving anti-retroviral treatment who have been monitored for viral load at least once a year to monitor treatment failure (%)	NT	9.1	NT	19.3	50	48.5	<0.0001
Total number of methadone maintenance treatment sites	500	503	657	602	705	680	<0.001
Total cumulative number of the patients who have received methadone maintenance treatment	66 000	97 554	115 700	178 684	136 200	241 975	
Total number of the patients currently receiving methadone maintenance treatment	46 200	61 557	75 205	93 997	88 530	112 831	
Annual retention rate of drug users in methadone maintenance treatment for 12 months (%)	70	71.7	65	69.5	65	65.2	0.0017
Average number of drug users receiving methadone maintenance treatment per clinic	150	122	150	156	150	166	
Proportion of sex workers receiving HIV/STD intervention measures (%)	70	78.4	70	91.4	70	74.3	>0.05
Proportion of men who have sex with men receiving intervention measures (%)	NT	74.3	50	83.9	80	75.4	>0.05

NT=no target was set.

remained in the treatment program for at least 1 year was roughly stable for the years 2007–09, at 82.3~84.4%. The annual retention rate for drug users in the methadone program decreased from 71.7% in 2007 to 65.2% in 2009.

Discussion

Progress has been made in achieving the goals of the Chinese national AIDS program in recent years. Although political and financial commitment has

laid the foundation for these achievements, quantitative monitoring of the nation-wide implementation of the program by the NCAIDS has played a crucial role. The unified web-based national AIDS data system makes this quantitative monitoring feasible and timely (detailed information can be found in the article by Dr Mao and her colleagues, in the issue).¹¹

This quantitative monitoring approach was initially met with great resistance from both technical divisions of the NCAIDS/China CDC and local implementers since these specific measurable targets hold them accountable and responsible. The pilot of two indicators in 2006 helped to develop meaningful and acceptable indicators and targets for 2007–09. Observable increases in coverage encouraged both central and local public health officials to continue this monitoring strategy.

Continuing review and refinement of indicators and targets has helped implementers to understand core elements of the national AIDS program. All core indicators covered critical measures to identify HIV-infected individuals, to reduce secondary transmission of HIV to sexual and needle sharing partners, and to reduce deaths caused by AIDS. It is believed that continuing this exercise will have a positive impact on controlling the HIV/AIDS epidemic in China.

Although progress has been made and coverage has increased, coverage still often falls below targets and may be insufficient to prevent the further spread of HIV or to significantly reduce mortality from AIDS. Estimations made in 2005, 2007 and 2009^{4,12,13} suggested that the number of new HIV infections reduced from 70 000 per year in 2005 to 50 000 per year in 2007, and further to 48 000 per year in 2009, but the number of people living with HIV/AIDS increased from 650 000 in 2005 to 700 000 in 2007 and to 740 000 in 2009. While the number of patients covered by the national free anti-retroviral treatment has increased each year, the number of deaths among people living with AIDS has also

increased: from 5544 in 2007 to 9748 in 2008 and to 12 287 in 2009.

Quantitative performance monitoring is focused on the process of implementation. In the early stages, particularly when the indicators values were low, significant change or improvement could be easily achieved and feedback was encouraging, motivating health officials at central and local levels to work hard. As the value of these core indicators becomes elevated, an incremental change or improvement will be less. Thus, maintaining the momentum will become more difficult. The monitoring system will need to shift focus to maintain good coverage and to ensure the quality of programmes is high. For example, patients on ART are currently monitored annually for CD4⁺, but a shorter interval may be required to prevent the adverse consequences of treatment failure.¹⁴

In summary, remarkable improvements have been observed in the implementation of the national AIDS program in China from 2007 to 2009. The strategy of setting targets and making local implementers accountable and monitoring core indicators has facilitated the implementation of the national AIDS program in China.

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KEY MESSAGES

- China's national HIV/AIDS prevention, treatment and care programs have significantly improved in the past 3 years.
- Setting annual targets for core indicators and monitoring performance that hold implementers accountable has facilitated implementation of the national AIDS program in China.

References

- ¹ Zeng Y, Wang B, Zheng X *et al.* [Serological screening of HIV antibody in China]. *Chinese J Epidemiol* 1988;**9**: 138–40.
- ² Wu Z, Rou K, Cui H. The HIV/AIDS epidemic in China: history, current strategies and future challenges. *AIDS Educ Prev* 2004;**16**(3 Suppl A):7–17.

³ State Council AIDS Working Committee Office, UN Theme Group on HIV/AIDS in China. *A Joint Assessment of HIV/AIDS Prevention, Treatment and Care in China (2004)*. Beijing: China Ministry of Health, 2004.

⁴ State Council AIDS Working Committee Office, UN Theme Group on AIDS in China. *A Joint Assessment of HIV/AIDS Prevention, Treatment and Care in China (2007)*. Beijing: China Ministry of Health, 2007.

- ⁵ Wu Z, Sullivan SG, Wang Y, Rotherum-Borus MJ, Detels R. The evolution of China's response to HIV/AIDS. *Lancet* 2007;**369**:679–90.
- ⁶ State Council of P.R. China. *China's Action Plan for Reducing and Preventing the Spread of HIV/AIDS (2006–2010)*. Beijing: State Council Office, 2006.
- ⁷ State Council AIDS Working Committee Office. *Framework for Monitoring and Evaluation of China National AIDS Program*. Beijing: People's Health Publishing House, 2007.
- ⁸ Warner-Smith M, Rugg D, Frescura L, Moussavi S. Monitoring the 2001 Declaration of Commitment on HIV/AIDS. *J Acquir Immune Defic Syndr* 2009;**52(Suppl. 2)**: S77–86.
- ⁹ WHO, UNAIDS. *Monitoring and evaluation toolkit: HIV, Tuberculosis and Malaria and health systems strengthening-Part 1: the MeE system and Global Fund MeE requirements*. Geneva: The Global Fund to Fight AIDS, Tuberculosis & Malaria, 2009.
- ¹⁰ WHO, UNAIDS, UNICEF. *A Guide on Indicators for Monitoring and Reporting on the Health Sector Response to HIV/AIDS*. Geneva: WHO, 2009.
- ¹¹ Mao Y, Wu Z, Wang C, Qin Q, Ma Y, Ma W. Development of a unified web-based national HIV/AIDS information system in China. *Int J Epidemiol* 2010;**39(Suppl 2)**:ii79–89.
- ¹² Ministry of Health of China, UNAIDS, WHO. *2005 Update on the HIV/AIDS Epidemic and Response in China*. Beijing: Ministry of Health, 2006.
- ¹³ Ministry of Health of China, UNAIDS, WHO. *The Estimation of HIV/AIDS in China in 2009*. Beijing: Ministry of Health, 2010.
- ¹⁴ Petersen ML, van der Laan MJ, Napravnik S, Eron JJ, Moore RD, Deeks SG. Long-term consequences of the delay between virologic failure of highly active antiretroviral therapy and regimen modification. *AIDS* 2008;**22**: 2097–106.