

Using program evaluation to improve the performance of a TB-HIV project in Banteay Meanchey, Cambodia

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SUMMARY

SETTING: Cambodia has the highest human immunodeficiency virus (HIV) prevalence (1.9%) and tuberculosis (TB) incidence (508/100 000) in Asia. Banteay Meanchey, a province with high HIV prevalence of 1.9%, established a pilot project in 2003 to enhance TB-HIV activities. We evaluated this project to improve performance.

METHODS: In March 2005, we analyzed 17 months of data on all persons diagnosed with HIV or TB at 11 participating clinics. We determined barriers to HIV testing and TB screening, modified the program to reduce these barriers and assessed whether our interventions improved testing and screening rates.

RESULTS: Among 952 patients newly diagnosed with TB disease, 138 (14%) had known HIV infection at the time

of TB diagnosis. Of the 814 TB patients with unknown HIV status, 432 (53%) were HIV tested. Of 1228 persons newly diagnosed with HIV infection, 450 (37%) were screened for TB disease. We found and addressed barriers to HIV testing and TB screening. In the 9 months after the interventions, 240/322 (71%) TB patients were HIV tested, an increase of 34% ($P < 0.01$); 426/751 (57%) HIV-infected patients were screened for TB, an increase of 54% ($P < 0.01$).

CONCLUSION: Evaluations of TB-HIV collaborative activities can lead to increased TB screening and HIV testing rates.

KEY WORDS: tuberculosis; HIV; epidemiology; program evaluation; Cambodia

IN CAMBODIA, the tuberculosis and human immunodeficiency virus (TB-HIV) syndemic¹⁻³ has had a tremendous public health impact. Cambodia has the highest adult HIV prevalence in South-East Asia, at 1.9%.⁴ The World Health Organization (WHO) has designated Cambodia as one of the 22 high-burden TB countries, with an estimated TB case rate of 508 per 100 000 population in 2003.⁵ Currently, 13% of all TB cases are estimated to be HIV-associated.^{5,6} In Cambodia and worldwide, TB is one of the most common causes of death in HIV-infected persons.⁷ The mortality rate of HIV-infected TB patients in Cambodia is estimated to be 25%,⁸ a rate similar to that reported in other South-East Asian countries and higher than those reported in many African countries.⁹⁻¹¹

In countries with generalized HIV epidemics, the WHO recommends that all TB patients be offered HIV testing and that all HIV-infected persons be screened for TB disease.⁷ In October 2003, the US Centers for Disease Control and Prevention (CDC) and the United States Agency for International Development (USAID)

assisted in launching a TB-HIV pilot project in Banteay Meanchey, a rural province in north-west Cambodia with an HIV prevalence of 1.9%.¹²

The objectives of the Banteay Meanchey TB-HIV pilot project are to offer all TB patients HIV testing through referral to HIV counseling and testing clinics, to offer all persons newly diagnosed with HIV screening for TB disease through referral to TB clinics and to offer all HIV-infected TB patients appropriate acquired immune-deficiency syndrome (AIDS) care services, including antiretroviral treatment (ART) and cotrimoxazole preventive treatment (CPT). The initial program monitoring data of the provincial health department (PHD) suggested that only about half of all TB patients were being HIV tested and half of all HIV-infected persons were receiving TB screening.

We evaluated the first 17 months of the project to determine the exact proportion of patients receiving HIV counseling and testing and TB screening. We also sought to identify barriers to receiving these services and to evaluate the routine monitoring and evaluation

system. After recommendations from this evaluation had been incorporated into the program, we measured their impact on program performance.

METHODS

In February and March 2005, we evaluated activities conducted by the TB-HIV pilot project in Banteay Meanchey from 1 October 2003 to 28 February 2005.

Context

Banteay Meanchey has a population of 650 000, divided into four operational districts. Its health system includes one referral hospital in each operational district and 49 health centers. All health centers and referral hospitals function as TB clinics, diagnosing and treating TB patients. The province also has five HIV counseling and testing clinics (known in Cambodia as VCCT, for 'voluntary counseling and confidential testing'). Rapid HIV testing is performed and test results are generally returned to the patient on the same day. Four of the VCCT clinics are located in the four referral hospitals and the other is located in the provincial capital city at the largest health center in the province. All VCCT clinics are located in a facility with a TB clinic, although the TB and VCCT clinics are in separate buildings. Other TB clinics can be up to 2 h driving distance from the nearest VCCT. The TB and HIV programs in Banteay Meanchey and all of Cambodia have separate staff and supervisory personnel.

The pilot project was implemented in two of the four operational districts, which together contain 32 health centers, including the health center in the provincial capital, which has a VCCT site, and two referral hospitals, each of which has a TB clinic and a VCCT. The project included all three of these VCCT sites (the three largest VCCT sites in the province) and 11 TB clinics (including three located within the same facility as the above VCCT sites and eight others throughout the two operational districts included in the study). Participating sites were chosen by the provincial health department, and include the TB clinics and VCCT sites with the highest patient volume in the province.

Before the pilot project was launched, staff at all participating clinics underwent training to refer all TB patients for HIV testing to the nearest VCCT site and to refer all HIV-infected persons for TB screening to the nearest TB clinic. As routine TB and HIV program registers did not capture information about referrals between services, two log books were added to the TB clinics—one to record information about all patients referred to a VCCT clinic for HIV testing, including HIV testing results, and another to record information about all HIV-infected persons who arrived at the TB clinic to be screened for TB, including the results of that screening. Likewise, two log books were

added to the VCCT sites—one to record information about all HIV-infected persons referred to TB clinics for TB screening, including the results of screening, and one to record information about TB patients who arrived at the VCCT site for HIV testing, including the HIV test result.

Data collection

We visited all three VCCT sites and all 11 TB clinics participating in the TB-HIV project to collect epidemiological and clinical data about every patient diagnosed with TB and every person diagnosed with HIV by these facilities during the study period. We abstracted data from public health registers and the log books used as part of the project. During the evaluation period, ART was not routinely available in Banteay Meanchey.

We conducted semi-structured interviews with all TB staff and VCCT counselors working at the participating clinic sites, asking them about current policies and practices for TB-HIV, knowledge, attitudes and beliefs of patients and staff about TB-HIV and potential barriers to TB screening of HIV-infected persons and to HIV testing of TB patients. We conducted two group interviews with a convenience sample of persons living with HIV/AIDS by interviewing persons involved in support groups in the participating operational districts to assess their knowledge, attitudes and beliefs about TB-HIV and potential barriers to TB screening.

Definitions used for data analysis

VCCT log books included the patient's self-reported reason for attending the VCCT clinic, including self-presentation with and without symptoms, self-presentation due to perceived risk, marital status, pregnancy, parent or partner with HIV infection and other. For analysis, we categorized 'self-presentation with symptoms' as 'ill at the time of VCCT visit', and all other responses as 'not ill at the time of VCCT visit'.

Patients were considered screened if they completed the screening recommended by their provider. TB screening varied among providers, but required at least a clinical examination and sputum smear microscopy. Chest radiography was also often performed. Any patient diagnosed with TB by the provider was considered to have TB disease. TB is diagnosed using a standard national protocol.¹³

Data analysis

To evaluate the performance of the routine monitoring and evaluation system currently in place, we used that system to calculate values for the relevant WHO TB-HIV indicators. These included the proportion of TB patients tested for HIV infection and the prevalence of HIV among TB patients.¹⁴ We then compared these values to those we calculated using data from this evaluation.

For categorical variables, we compared proportions using χ^2 and, when appropriate, Fisher's exact test. For continuous variables, we compared medians using the Wilcoxon rank-sum test. For multivariable analysis, we included all variables described above in our initial models. We developed our final models using manual, backward, step-wise variable selection, keeping variables in the model with $P < 0.05$. Because children were not eligible to be employed or married, we excluded persons aged <18 years from multivariable analyses that included job and marital status as model terms. To calculate the adjusted odds ratios (aORs) for persons aged <18 , we developed separate models that did not include marital status and occupation.

Intervention and follow-up evaluation

In March 2005, the Banteay Meanchey PHD modified its TB-HIV pilot project based on findings from our evaluation. The PHD began holding monthly educational meetings for all TB and VCCT staff, developed a supplemental data collection form to collect information about HIV status, referral for HIV testing, CPT status and AIDS care status for all TB patients, and developed a written script for VCCT counselors to read to persons newly diagnosed with HIV infection. We analyzed program monitoring data for April 2005 to December 2005 to measure the impact of these interventions on HIV testing and TB screening rates.

Ethical review

The study underwent ethical review and was determined by the National Center for HIV, STD and TB Prevention at the CDC not to constitute research and thus not require full review by an institutional review board. The Cambodia Ministry of Health also determined that this was a programmatic evaluation and therefore did not require ethical review.

RESULTS

Case finding and demographics

There were 952 TB patients, 215 (23%) of whom were known to be HIV-infected. Most TB patients were men, and most were categorized as new cases with sputum smear-positive pulmonary disease (Table 1).

There were 1228 HIV-infected persons, of whom 52% were female. The median age was 33 years. Most HIV-infected persons were unskilled workers. The most common reason for presenting to a VCCT site was self-reported symptoms (Table 2).

Referrals from TB to a VCCT clinic for HIV testing

Of the 952 TB patients diagnosed during the study period, 138 (14%) had known HIV infection at the time of TB diagnosis. The remaining 814 TB patients had unknown HIV status and were therefore eligible

Table 1 Characteristics of tuberculosis patients ($N = 952$)

Characteristic	<i>n</i> (%)
Female	399 (42)
Median age, years (range)	42 (1–84)
VCCT facility on site	494 (52)
HIV test result	
Positive	215 (23)
Negative	357 (38)
Status unknown	380 (40)
Type, location of TB	
Smear-positive, pulmonary	511 (54)
Smear-negative, pulmonary	261 (27)
Extra-pulmonary	179 (19)
Category of TB	
New	886 (93)
Treatment after failure or relapse	31 (3)
Other	34 (4)

HIV = human immunodeficiency virus; VCCT = voluntary counseling and confidential testing; TB = tuberculosis.

for referral to a VCCT site. Of these, 454 (56%) were referred to a VCCT clinic, 432 (53%) underwent counseling and testing, and 77 (18%) of these had a positive test result. All patients who underwent counseling agreed to HIV testing. The median time from TB diagnosis to HIV testing was 5 days.

In multivariable regression analysis, three factors were independently associated with not being referred to VCCT and tested for HIV infection. Persons aged <18 years were over four times as likely not to

Table 2 Characteristics of persons with HIV infection ($N = 1228$)

Characteristic	<i>n</i> (%)
Female	644 (52)
Median age, years (range)	33 (1–72)
Occupation*	
Unskilled	914 (74)
Semi-skilled or skilled	87 (7)
Child	70 (6)
Other	147 (12)
Indication for HIV testing	
Self-demand with perceived risk	247 (20)
Self-demand with symptoms	370 (30)
Self-demand without symptoms and without perceived risk	161 (13)
Pre-marital	19 (2)
Partner or parent with HIV	290 (24)
Partner with risk behavior	68 (6)
Referred from health services	19 (2)
Other	50 (4)
Marital status	
Single	217 (18)
Married	660 (54)
Widowed	346 (28)

* Occupations classified as 'unskilled' included: sex worker, karaoke and beer promoter, fisherman, housewife, farmer, factory worker, mechanic, construction worker, driver, motorcycle taxi driver, laborer, seller or de-miner. Occupations classified as 'semi-skilled' included: policeman, military, soldier, dressmaker, tailor, craftsman trade, artisan, artist, or monk. Occupations classified as 'skilled' included: officer, NGO officer, company worker, health care worker, or teacher. We categorized all unclassified occupations as 'other.'
HIV = human immunodeficiency virus; NGO = non-governmental organization.

Table 3 Tuberculosis patient characteristics associated with not being tested for HIV*

Characteristic	Patients not tested n/N (%)	RR (95%CI)	aOR (95%CI)
Age, years			
<18	18/23 (78)	2.0 (1.5–2.7) [†]	5.0 (1.7–15.2) [†]
18–34	79/205 (39)	Referent	Referent
≥35	283/584 (48)	1.3 (1.0–1.5) [†]	1.4 (0.98–2.0)
Sex			
Male	219/472 (46)	0.98 (0.84–1.1)	NS
Female	161/340 (47)	Referent	NS
Type and location of TB			
Smear-positive, pulmonary	181/460 (39)	Referent	Referent
Smear-negative, pulmonary	119/211 (26)	1.4 (1.2–1.7) [†]	1.8 (1.2–2.6) [†]
Extra-pulmonary	80/141 (21)	1.4 (1.2–1.7) [†]	3.3 (2.1–5.2) [†]
VCCT on site			
Yes	104/376 (28)	Referent	Referent
No	276/436 (63)	2.3 (1.2–2.7) [†]	5.5 (4.0–7.6) [†]

* Limited to TB patients without a prior HIV diagnosis, and thus eligible for referral ($n = 812$).

[†] $P < 0.05$.

HIV = human immunodeficiency virus; RR = relative risk; CI = confidence interval; aOR = adjusted odds ratio; NS = not included in final multivariable model; TB = tuberculosis; VCCT = voluntary counseling and confidential testing.

be HIV tested compared with persons aged ≥ 18 . Patients with sputum smear-negative or extra-pulmonary disease were more than twice as likely not to be tested as those with smear-positive pulmonary disease. Patients receiving TB diagnosis and treatment at a facility that did not contain a VCCT facility were five times as likely not to be tested (Table 3).

All 11 TB clinic staff interviewed reported that many TB patients did not perceive themselves to be at risk for HIV infection.

Referrals from VCCT sites to TB clinics for TB screening

Of the 1228 VCCT patients reported as HIV-infected, 450 (37%) completed TB screening and 107 (24%) of these were diagnosed with TB disease.

In multivariable regression analysis, several factors independently predicted who would not be screened for TB: persons aged < 35 years, semi-skilled and skilled workers and patients who did not report being ill at the time of presentation to VCCT (Table 4).

Table 4 HIV patient characteristics associated with not being screened for tuberculosis ($n = 1150$)^{*}

Characteristic	Patients not screened n/N (%)	RR (95%CI)	aOR (95%CI)
Age, years			
<35	400/610 (66)	Referent	Referent
≥35	313/540 (58)	0.88 (0.81–0.97) [†]	0.75 (0.58–0.96) [†]
Sex			
Male	340/539 (63)	1.0 (0.94–1.1)	NS
Female	373/611 (61)	Referent	NS
Marital status			
Single	96/141 (68)	Referent	NS
Married	403/660 (61)	0.90 (0.79–1.0)	NS
Widowed	211/346 (61)	0.90 (0.78–1.0) [†]	NS
Occupation [‡]			
Unskilled	551/914 (60)	Referent	Referent
Semi-skilled or skilled	66/87 (76)	1.3 (1.1–1.4) [†]	2.1 (1.2–3.5) [†]
Other	94/139 (68)	1.1 (0.99–1.3)	1.4 (0.97–2.1)
Reason for presentation			
Patient feels ill	181/368 (49)	Referent	Referent
Patient does not feel ill	532/782 (68)	1.4 (1.2–1.6) [†]	2.1 (1.6–2.7) [†]

* This model excludes persons < 18 years of age.

[†] $P < 0.05$.

[‡] Occupations classified as 'unskilled' included: sex worker, karaoke and beer promoter, fisherman, housewife, farmer, factory worker, mechanic, construction worker, driver, motorcycle taxi driver, laborer, seller, or de-miner. Occupations classified as 'semi-skilled' included: policeman, military, soldier, dressmaker, tailor, craftsman trade, artisan, artist, or monk. Occupations classified as 'skilled' included: officer, NGO officer, company worker, health care worker, or teacher. We categorized all unclassified occupations as 'other'.

HIV = human immunodeficiency virus; RR = relative risk; CI = confidence interval; aOR = adjusted odds ratio; NS = not included in final multivariable model; NGO = non-governmental organization.

All six VCCT staff interviewed reported that patients who felt well did not want to be screened for TB. Likewise, >50% of the 60 persons living with HIV/AIDS who were interviewed reported that counselors may not have provided convincing reasons to be screened for TB and that HIV-infected persons often therefore did not believe that they were likely to have TB disease.

Intervention and follow-up evaluation

In the period after the PHD modified the TB-HIV project (1 April–31 December 2005), 601 TB patients were registered at the 11 TB clinics participating in the project, including 279 (46%) with known HIV status. Of the 322 with unknown status, 230 (71%) were tested for HIV infection, compared with 53% before the interventions, an increase of 34% ($P < 0.01$). Of the 230 tested, 32 (14%) had a positive test result. During the same interval, 426/751 (57%) persons diagnosed with HIV infection at the three participating VCCT sites completed TB screening, an increase of 54% ($P < 0.01$). Of the 426 persons completing TB screening, 100 (23%) were diagnosed with TB.

Monitoring and evaluation

As part of the routine monitoring and evaluation program, data on the total number of TB patients referred to a VCCT site and tested for HIV infection and the total number of HIV-infected persons referred to a TB clinic and screened for TB are collected monthly. This routine monitoring and evaluation data indicated that 432 (45%) of the 952 TB patients were HIV-tested and that 78 (18%) of these were HIV-infected. Using data from our evaluation, we found that 432 (53%) of 812 TB patients eligible for referral (i.e., those without a previous HIV test result) were HIV-tested, and that 215 (38%) of 573 TB patients with an HIV test result recorded were HIV-infected. In both cases, the proportions calculated using routine data compared with the proportions calculated using our data were statistically different ($P < 0.001$). Routine monitoring and evaluation data do not capture information about patients with a previous HIV test result. These patients would be recorded as not referred for HIV testing and their HIV status would be recorded as unknown.

CONCLUSIONS

In the first 17 months of its TB-HIV project, the Banteay Meanchey PHD successfully implemented HIV testing of TB patients and TB screening of HIV-infected persons, and demonstrated the high yield of these activities. However, the evaluation also found that referral rates between services could be increased by addressing specific barriers that were identified.

We found that certain groups of patients, such as patients with sputum smear-negative pulmonary TB

or extra-pulmonary TB and young patients, were less likely to be tested for HIV infection than sputum smear-positive, older patients. Likewise, semi-skilled and skilled workers, younger patients and persons who were not ill were less likely to be screened for TB than unskilled workers, older patients and persons who were ill. These findings led us to believe that, rather than embracing universal testing and screening, decisions were often made by patients and providers based on perceived risk. This was supported by findings from our interviews. We previously found that HIV infection was common among all of these sub-groups of TB patients and that TB was common among all sub-groups of HIV-infected persons;⁸ these perceptions of risk were therefore often inaccurate. We posited that these perceptions were probably related to inadequate patient and provider knowledge and that the proportion of HIV-infected persons screened for TB could be increased by addressing the barriers identified.

Based on these findings, the PHD implemented evidence-based changes, including monthly meetings to educate providers that all patients are at risk and should be screened, a standardized script for VCCT counselors to read to HIV-infected clients explaining that all HIV-infected persons are at high risk for TB and should be screened, and a supplementary data collection form for TB clinics. The data collection form included HIV-related data and was attached to each TB patient's treatment card; it therefore ensured that TB staff were aware of the patient's HIV status and reminded TB providers to refer patients with unknown status to be tested. When the National TB Program adopted a new register that included this HIV information in January 2006, the form was no longer needed. These interventions successfully overcame many barriers to referral and improved program performance.

Patients treated at a clinic with no VCCT facility on site were less likely to be HIV-tested, highlighting the importance of making HIV testing as widely available as TB diagnostic testing. Because VCCT services are not available at all health centers, the PHD currently pays for TB patients to be transported to VCCT services; whether this is more cost-effective than making HIV testing more widely available should be studied further. If current efforts are not successful in increasing HIV testing rates, strong consideration should be given to implementing a routine counseling and testing model, as recommended by the WHO and UNAIDS, rather than the voluntary counseling and testing model currently used in this project.^{15,16}

We also found that evaluating the monitoring and evaluation system provided useful information for the program and potentially useful feedback for the WHO. In particular, we found that collecting data about TB patients with a pre-existing diagnosis of HIV infection allowed more accurate calculation of HIV prevalence among TB patients and of the proportion of TB patients tested for HIV, as those who were previously

diagnosed with HIV infection are not actually eligible for referral.

This study was limited by the retrospective nature of its design, as we were limited to the data available in existing records, some of which were incomplete.

This evaluation accurately determined current program performance and identified specific barriers that were successfully targeted with inexpensive interventions. Based on the success of this evaluation and subsequent interventions, the PHD decided in early 2006 to expand the project to cover the remaining 42 TB and two VCCT clinics in the province. Targeted evaluations such as this are essential for developing an evidence-based approach toward removing barriers to collaboration between TB and HIV programs.

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R É S U M É

CADRE : En Asie, c'est au Cambodge que se situe la prévalence la plus élevée de virus de l'immunodéficience humaine (VIH) (1,9%) et l'incidence la plus élevée de tuberculose (TB) (508/100 000). La province de Banteay Meanchey, où la prévalence du VIH est élevée (1,9%), a mis en œuvre en 2003 un projet pilote pour renforcer les activités TB-VIH. Nous avons évalué ce projet pour améliorer les performances.

MÉTHODES : En mars 2005, nous avons analysé 17 mois de données concernant les personnes diagnostiquées comme atteintes de VIH ou de TB dans les 11 polycliniques participant à l'enquête. Nous avons déterminé les barrières au test VIH et au dépistage de la TB, modifié le programme pour réduire ces barrières et évalué dans quelle mesure nos interventions amélioraient les taux des tests et du dépistage.

RÉSULTATS : Parmi 952 patients atteints d'une maladie

TB récemment diagnostiquée, 138 (14%) avaient une infection VIH connue au moment du diagnostic de la TB. Des 814 patients TB dont le statut VIH était inconnu, 432 (53%) ont été testés pour le VIH. Parmi les 1228 personnes récemment diagnostiquées comme infectées par le VIH, 450 (37%) ont été dépistés pour une maladie TB. Nous avons mis en évidence les barrières au test VIH et au dépistage de la TB et y avons donné une réponse. Pendant les 9 mois suivant les interventions, 240/322 (71%) patients TB ont subi un test VIH, une augmentation de 34% ($P < 0,01$); 426 des 751 patients infectés par le VIH ont subi un dépistage pour la TB, une augmentation de 54% ($P < 0,01$).

CONCLUSIONS : L'évaluation des activités de collaboration TB-VIH peut entraîner une augmentation du dépistage de la TB et des taux de test VIH.

MARCO DE REFERENCIA: Camboya presenta la mayor prevalencia (1,9%) de infección por el virus de la inmunodeficiencia humana (VIH) y la mayor incidencia de tuberculosis (TB) (508/100 000) en Asia. En Banteay Meanchey, una provincia con alta prevalencia de infección por el VIH (1,9%), se instauró en 2003 un proyecto experimental destinado a fortalecer las actividades conjuntas TB y VIH. Se llevó a cabo una evaluación del proyecto con el propósito de optimizar su rendimiento.

MÉTODOS: En marzo de 2005 se analizaron los datos de 17 meses sobre todas las personas en quienes se estableció diagnóstico de infección por el VIH o de TB en los 11 consultorios participantes. Se definieron los obstáculos a la prueba del VIH y a la detección sistemática de la TB y se introdujeron en el programa las modificaciones necesarias para reducirlos; se evaluó luego el impacto de las intervenciones en la tasa de aplicación de las pruebas del VIH y de detección de la TB.

RESULTADOS: De los 952 pacientes con diagnóstico re-

ciente de TB, 138 (14%) presentaban infección conocida por el VIH en el momento del diagnóstico. De los 814 pacientes con TB y que desconocían el estado de su serología, 432 (53%) recibieron la prueba del VIH. De las 1228 personas con diagnóstico reciente de infección por el VIH, en 450 (37%) se practicó la detección sistemática de la TB. En el estudio se observaron obstáculos a la prueba del VIH y a la detección de la TB y se aportaron respuestas con el fin de superarlos. En los 9 meses que siguieron a las intervenciones, se practicó la serología del VIH a 240 de los 322 (71%) pacientes con TB, un aumento de 34% ($P < 0,01$); y se practicó la detección sistemática de la TB en 426 de los 751 (57%) pacientes infectados por el VIH, un aumento de 54% ($P < 0,01$).

CONCLUSIÓN: La evaluación de las actividades conjuntas TB y VIH puede conducir a un aumento en las tasas de detección sistemática de la TB y de aplicación de la prueba diagnóstica del VIH.
