



Implementing intensified tuberculosis case-finding among street-connected youth and young adults in Kenya

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Background: Street-connected youth and young adults (SCY) suffer a myriad of health problems. In Kenya, SCY are at high risk for tuberculosis (TB) due to their congregate living situations. TB screening is not routinely implemented in SCY and there has been no published literature on the burden of TB in SCY in western Kenya.

Program description: In 2011, the AMPATH TB Program, an experienced TB screening program, partnered with the Tumaini Center, a trusted street youth organization, to conduct intensified case finding (ICF) for pulmonary TB among SCY. Our program aimed to investigate the numbers of SCY who reported symptoms and those diagnosed with smear-positive pulmonary TB, and link SCY with TB to treatment.

Results: Of 116 SCY who were screened, 114 (98%) had a positive questionnaire; 104 (90%) provided a spot sputum sample, 39 (34%) provided a morning sputum sample, and 111 (97%) reported cough of >2 weeks. One street youth tested smear-positive for TB and was treated through to cure.

Conclusions: Implementing TB ICF is feasible in low-resource settings through unique collaborations between health care programs and community-based organizations. In addition to identifying smear-positive TB, our program uncovered a high burden of respiratory symptoms among SCY in Eldoret, Kenya.

In 2007, approximately 300 000 street-connected youth and young adults (SCY) were living in the streets in Kenya.¹ In Eldoret, western Kenya, there are more than 1000 SCY, of whom many remain on the streets into adulthood.² SCY can be defined as homeless children and young people who work and/or sleep on the streets, predominantly in urban areas, and who often congregate with other SCY or homeless individuals. They may or may not be adequately supervised by responsible adults.³ SCY are exposed to extreme poverty, abuse or neglect, leading to a life on the streets, and suffer from a myriad of health problems.⁴ Health care access and preventive services are limited, as this population is typically of low priority for health initiatives.⁵

Research in high-income countries demonstrates that SCY have higher rates of human immunodeficiency virus (HIV) than their non-street peers.⁶ HIV prevalence in Kenya is 5.6%.⁷ In a recent prevalence study in Eldoret, 6% of SCY were HIV-infected.⁸ Another local study revealed cough as the most common symptom of SCY and upper respiratory tract infection one of the most common health problems.²

In low- and middle-income countries (LMICs) such as Kenya, tuberculosis (TB) is among the top 10 causes of mortality, and is the leading cause of death in HIV-infected individuals.⁹ In children, the actual burden of TB is unknown and likely underestimated due to limitations in pediatric TB diagnostics.¹⁰ Kenya is one of the world's 22 high-burden TB countries. Among 89 294 new and relapse cases in 2014, 9% were among children <15 years of age and 36% of all TB patients were co-infected with HIV; the HIV status for TB disaggregated by age is not reported.¹¹

A systematic review of the health status of SCY in LMICs did not find any published studies addressing TB.⁵ Currently, to our knowledge, there is no published literature regarding TB or TB-HIV co-infection in SCY. Children exposed to pulmonary TB are at great risk for severe disease and progression to death, particularly when they are HIV-infected. In Kenya, SCY live, work, socialize and sleep together in congregate settings on the streets called 'barracks'. Their congregate living situation, coupled with their high burden of HIV, make SCY a particularly vulnerable and forgotten at-risk population for TB. The World Health Organization's (WHO's) Three I's initiative—intensified case-finding (ICF), isoniazid preventive therapy (IPT), and infection control—recommends that ICF be implemented for all people with or at high risk for HIV or who live in congregate settings.

Our site, the Academic Model Providing Access to Healthcare (AMPATH) at Moi Teaching and Referral Hospital (MTRH) in Eldoret, Kenya, conducts ICF in the community. This screening had not previously been extended to SCY. The Tumaini Center (TC), one of Eldoret's only front-line service providers for SCY, facilitates the linkage of SCY to health care services at the MTRH, but had not previously conducted TB screening. The TC and the AMPATH TB Projects Office created a joint initiative to implement ICF for Eldoret SCY. The purpose of our program was: 1) to investigate the number of SCY who report pulmonary TB symptoms, 2) to evaluate the number of SCY diagnosed with smear-positive pulmonary TB, and 3) to link SCY with pulmonary TB to treatment. This article will describe the program's implementation process, results, successes and lessons learned, and next steps for TB care and research among SCY.

PROGRAM DESCRIPTION

Setting

Eldoret is Kenya's fifth largest city, with an estimated population of 289 380, of whom 51.3% live below the

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poverty line. Kenya is experiencing a rapidly growing population coupled with rural-to-urban migration, which has led to the urbanization of poverty and the growth of slums surrounding the town. Over half of Eldoret's population (52%) are aged below 20 years.¹²

Program

AMPATH, a collaboration between Moi University College of Health Sciences (MUCHS), the MTRH and a consortium of North American medical institutions, serves a catchment population of 4 million and provides HIV care to more than 85 000 patients in 145 Ministry of Health facilities across western Kenya. The AMPATH TB Projects Office conducts ICF using a community and facility-based cough monitor (CM) model. CMs are lay individuals trained to screen individuals with a six-question screening tool and to collect sputum from those who screen positive, indicated by an affirmative answer to any of the questions (Table 1).^{13,14}

Founded in 2010, the TC works to empower SCY in Eldoret with the hope, knowledge, skills, opportunities and resources to find a healthy alternative to street life. The TC conducted extensive outreach targeting SCY on the streets of Eldoret, and, at the time of this TB screening program, ran a drop-in center 3 days a week where SCY could access a safe environment providing food, counseling, and basic education. The TC also aims to improve access to health care for SCY through the use of a medical outreach worker.

A CM from the AMPATH TB Program partnered with the medical outreach worker at the TC and conducted ICF at the TC and at six barracks between February and October 2011. SCY who identified themselves as spending their days and nights on the street in Eldoret were targeted for our ICF screening program. Some older barracks leaders also asked to be screened and were included.

Our program was implemented in two phases.

Phase 1

Together with the AMPATH TB Program, a protocol for implementing TB ICF at the TC was developed. The TC starts each day with a routine morning meeting. A 20 min TB sensitization talk and description of the screening process was developed for inclusion in this meeting to minimize disruption of routine activities and to 'normalize' the new initiative. Following sensitization, the CM conducted one-on-one interviews to administer the cough questionnaire to any willing SCY. If the questionnaire was positive, the SCY was asked to provide a spot sputum sample and was also instructed to provide a morning sputum sample on subsequent return to the TC. All samples underwent smear microscopy per the Kenya National Tuberculosis, Leprosy and Lung Disease Program (NTP) quality guidelines at the AMPATH TB laboratory.

Phase 2

To reach SCY who do not access the drop-in center regularly, the TC also conducts large outreach initiatives in Eldoret. Thus, the TC outreach staff had intimate knowledge of the SCYs' respective 'barracks'. The TC medical outreach worker received permission from the

TABLE 1 Screening questionnaire

Screening questions

- 1 Have you ever been told you have TB?
- 2 Has anyone who lived in your household (even if no longer alive) ever been told they have TB?
- 3 Do you have a cough that has lasted more than 2 weeks?
- 4 Have you ever coughed up blood in the past year?
- 5 Do you have a fever that has lasted more than 3 weeks?
- 6 Have you lost weight in the last year?

TB = tuberculosis.

barracks leaders to conduct TB sensitization and screening on site, which followed the same format as Phase 1. Spot sputum samples were collected immediately, while the morning sputum collection was coordinated between the CM, the outreach worker, the individual, and barrack leaders (Figure).

The ICF program was targeted at TB screening in the community setting. Provider-based HIV testing is offered at all facilities and for any individual with TB disease on referral to a facility. This program did not have the capacity to conduct community-based HIV testing along with TB screening.

After each ICF session, the CM and the TC medical outreach worker met with the TC and AMPATH TB program leadership to discuss the event and review any logistical challenges.

Data collection and analysis

The CM recorded the basic demographic data and cough questionnaire responses on pre-existing AMPATH ICF standardized forms. Sputum results were processed through the AMPATH TB laboratory and reported back to the CMs, who then informed the participating SCY. Data from the CM questionnaires and sputum results were de-identified and extracted into a Microsoft Excel database (Microsoft Corp, Redmond, WA, USA). Descriptive analyses were performed using SAS version 9.2 (SAS Institute, Cary, NC, USA).

Human subjects protection

The ICF program is part of standard of care as recommended by the WHO and the Kenyan NTP. The collection of de-identified data for program review and knowledge dissemination was approved by the Moi University School of Medicine Institutional Research and Ethics Committee (Eldoret, Kenya) and the Life-span Institutional Review Board at Brown University (Providence, RI, USA). Substance use is extremely common among street youth,¹⁵ and those SCY who appeared impaired due to drug or alcohol use were not included in the program. All the SCY diagnosed with TB were linked to the TB clinic for treatment.

RESULTS

Over an 8-month period, 116 SCY with a median age of 20 years (interquartile range [IQR] 15–25) were screened. As the TC provided services to individuals aged ≤ 18 years, the SCY screened there had a younger age distribution (IQR 14–17 years) than those screened

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FIGURE TB sensitization talk and screening at one of the 'barracks' in Eldoret, Kenya. TB = tuberculosis.

at the barracks (IQR 20–27 years). There were 41 (35%) SCY screened at the drop-in center vs. 75 (65%) at the barracks. Only 8 (7%) were female.

Of 114 (98%) SCY with a positive screening questionnaire, 104 (90%) provided a first spot sputum sample, while only 39 (34%) provided a morning sputum sample. The one street youth who tested smear-positive for TB tested negative for HIV upon linkage to care, and completed anti-tuberculosis treatment successfully (Table 2).

Cough was nearly ubiquitous, with 111 (97%) SCY reporting a cough of >2 weeks, including 100% of those screened at the drop-in center. More than half of the SCY (54%) reported fever, 29% reported weight loss, and 25% reported a personal history of TB or TB exposure (Table 3).

DISCUSSION

To our knowledge, this is the first documented attempt to implement screening for pulmonary TB in SCY. Our unique collaboration demonstrated that TB ICF is feasible in a vulnerable, high-risk population in an LMIC. Paramount to our success was the formation of a strong local partnership between the AMPATH TB Program, an experienced TB screening and treatment program, and the TC, a trusted street youth organization.

Specifically, the AMPATH TB staff and CM provided expertise on conducting TB screening and collecting sputum samples within the community, while the TC staff and medical outreach worker effectively granted access to this mobile, hard-to-reach

population. Many SCY distrust authority figures, including health care providers, given their histories of domestic violence and neglect, abuse by the police, and discrimination in the community.^{4,16} Tumaini's outreach and service delivery to the SCY population had earned their trust and created the opportunity for the AMPATH TB Program to conduct screening. Furthermore, we were able to gain access to two different networks of SCY: the younger SCY at the drop-in center, as well as older, more entrenched SCY living in the barracks.

We diagnosed one case of smear-positive pulmonary TB, who was treated through to cure. After linking him to the MTRH TB clinic, staff noted that he was having difficulty with appointment and treatment adherence. The Tumaini medical outreach worker and AMPATH TB treatment team arranged to conduct directly observed therapy (DOT) at the barracks. Without this partnership, this individual would likely have been lost to follow-up, as routine TB care does not incorporate DOT in Kenya.

The active TB case underwent HIV testing at the TB clinic for treatment initiation. One limitation of our program is that, in the context of community-based screening for TB, we were not able to perform HIV testing. The SCY were therefore not systematically offered HIV testing unless they were diagnosed with TB and brought to the facility. Another local study in Eldoret found a prevalence of HIV in the SCY population of 6%. It is not clear whether we can extrapolate these findings to this SCY population, as all the HIV-positive patients in that cohort were female.⁸

TABLE 2 Street-connected youth and young adults screened at the Tumaini Center or barracks

	Age 10–18 years		Age 19–30 years		Age ≥31 years		Total		Total N (%)
	Center n (%)	Barrack n (%)	Center n (%)	Barrack n (%)	Center n (%)	Barrack n (%)	Center n (%)	Barrack n (%)	
Screened	37	16	4	51	0	8	41	75	116
Females screened	5 (14)	1 (6)	1 (25)	1 (2)	0	0 (0)	6 (15)	2 (3)	8 (7)
Positive questionnaires	37 (100)	14 (88)	4 (100)	51 (100)	0	8 (100)	41 (100)	73 (97)	114 (98)
First spot sputum sample collected	30 (81)	12 (75)	4 (100)	50 (98)	0	8 (100)	34 (83)	70 (93)	104 (90)
Second morning sputum sample collected	19 (51)	1 (6)	3 (75)	15 (29)	0	1 (13)	22 (54)	17 (23)	39 (34)
Smear-positive	0	0	0	1 (2)	0	0	0	1 (1.3)	1 (0.9)

Contact investigation in Kenya is performed primarily to look for concomitant incident cases in the household or to find children aged <5 years to screen and prescribe IPT. The barracks members were screened for active TB through this program, and there were no children aged <5 years. Screening for latent tuberculous infection with tuberculin skin testing or interferon-gamma release assays is not yet routinely performed in Kenya.

Congregate settings raise the issue of infection control. As the barracks are mostly outdoors, these areas are more likely to be exposed to ventilation and sunlight, and transmission is presumably lower than in enclosed settings. The most effective form of infection control for TB is early case detection and rapid initiation of effective treatment, which are the outcomes of screening programs such as ours.¹⁷

While the diagnosis of only one TB case may appear to be low yield, the incidence of TB in Kenya was estimated at 246 per 100 000 population in 2014, so identifying one case in 116 SCY actually represents a higher than expected yield.¹¹ This pilot does not attempt to estimate TB incidence in SCY, as we only used smear microscopy and had a small convenience sample. At the time of this study, Xpert® MTB/RIF (Cepheid, Sunnyvale, CA, USA) was not available in Eldoret and culture was available only for retreatment cases. Further work needs to include additional diagnostic procedures such as culture or Xpert as well as a much larger SCY population followed prospectively to estimate the cumulative incidence of TB disease in SCY.

Nearly all SCY screened were symptomatic, and 97% reported a cough. The high prevalence of cough in SCY found in our program is similar to findings among SCY in Eldoret in 2001.² The WHO-recommended symptom screen for TB has not been validated in SCY, where other respiratory infections and irritants

(e.g., inhalant drugs and chronic exposure to environmental elements) may be factors in respiratory symptoms. Such a validation should be attempted, as the high prevalence of cough among SCY could potentially impair the efficacy of screening as currently designed. The underlying etiology of cough among SCY needs to be explored to link this population to appropriate treatment services and implement necessary preventive interventions.

Our program encountered several implementation challenges in conducting TB screening among SCY. First, obtaining morning sputum samples as recommended by the Kenyan NTP was difficult. Of the SCY screened, 34% provided a morning sample, 54% at the TC and 23% in the barracks. No patient refused, but locating the SCY at the correct time was challenging. This likely reflects the inherent fluidity and chaos of SCY lives, which are driven largely by survival. The high prevalence of substance abuse also potentially prevented youth from being able to meet the CM reliably in the morning to provide a second sample.¹⁵ Second, our program had a 15:1 male-to-female ratio of screened individuals, which likely underrepresents females. While there are fewer females living on the street than males, females have a significantly higher HIV burden, underscoring the importance of ICF for TB in females.^{4,8} Other studies in the region had greater female participation by implementing targeted programming for girls. Our program might have had more success in screening females if we had created a girls-only activity.

In conclusion, implementing TB ICF for SCY is possible in LMICs through unique collaborations between ongoing health care programs and community-based organizations. The SCY in our program had high rates of respiratory symptoms, which may be due to TB or to other health conditions that will lead to further health impairment if left undiagnosed and untreated. Through collaborative approaches within trusted systems where

TABLE 3 Questionnaire results for all street-connected youth and young adults screened in the Tumaini Center vs. barracks

	Center n (%)	Not answered n	Barrack n (%)	Not answered n	Total N (%)
Screened	41		75		116
Personal TB history	10 (24)	0	19 (25)	0	29 (25)
TB exposure	13 (32)	0	16 (21)	0	29 (25)
Cough*	40 (100)	1	71 (95)	0	111 (97)
Hemoptysis†	9 (23)	1	11 (15)	0	20 (17)
Fever‡	22 (56)	2	40 (53)	0	66 (54)
Weight loss§	12 (32)	3	31 (41)	0	33 (29)

*1 with data missing: N = 115.

†1 with data missing: N = 115.

‡2 with data missing: N = 114.

§3 with data missing: N = 113.

TB = tuberculosis.

SCY feel 'safe', they can be engaged in effective screening programs. Further implementation of collaborative health care programs aimed at this marginalized population as well as operational research studying these interventions is needed to improve the health and well-being of SCY globally.

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Contexte : Les jeunes et les adultes vivant dans la rue (SCY) souffrent d'une myriade de problèmes de santé. Au Kenya, les SCY ont un risque élevé de tuberculose (TB) à cause de la promiscuité de leur habitat. Le dépistage de la TB n'est pas mis en œuvre en routine parmi les SCY et il n'y a eu aucune littérature publiée sur le poids de la TB chez les SCY de l'ouest du Kenya.

Description du programme : En 2011, le programme TB AMPATH, un programme de dépistage de TB expérimenté, a établi un partenariat avec le Tumaini Center, une organisation fiable de jeunes de la rue, afin de réaliser une recherche de cas intensifiée (ICF) de la TB pulmonaire parmi les SCY. Notre programme a eu pour but de rechercher le nombre de SCY qui présentaient des symptômes et ceux qui ont eu un diagnostic de TB pulmonaire à frottis positif, et

enfin de mettre en contact les SCY avec un site de traitement de la TB.

Résultats : De 116 SCY qui ont été dépistés, 114 (98%) ont remis un questionnaire positif, 104 (90%) ont fourni un échantillon de crachats, 39 (34%) un échantillon matinal et 111 (97%) ont fait état d'une toux de >2 semaines. Un jeune de la rue a eu un frottis positif pour la TB et a été traité avec succès.

Conclusions : La mise en œuvre de l'ICF de TB est faisable dans un contexte de faibles ressources à travers une unique collaboration entre les programmes de soins de santé et les organisations communautaires. En plus d'identifier la TB à frottis positif, notre programme a révélé un lourd fardeau de symptômes respiratoires parmi les SCY d'Eldoret, au Kenya.

Marco de referencia: Los jóvenes y los adultos jóvenes en situación de calle (SCY) sufren de una miríada de problemas de salud. En Kenia, los SCY tienen un alto riesgo de contraer la tuberculosis (TB), dada la situación de su convivencia. La detección de la TB no se practica de manera sistemática en esta población y no existen publicaciones científicas sobre la carga de morbilidad por TB en los SCY en el oeste de Kenia.

Descripción del programa: En el 2011, el Programa TB AMPATH, un programa con experiencia en la detección sistemática de la TB, creó una alianza con el Tumaini Center, que es una organización reconocida que se ocupa de los SCY; su objetivo fue realizar una búsqueda intensiva de casos de TB pulmonar en esta población de jóvenes. El presente estudio tuvo por objeto investigar el número de SCY que refirieron síntomas y la cantidad de casos de TB pulmonar

con baciloscopia positiva que se diagnosticaron, y vincular los SCY diagnosticados con los centros de tratamiento.

Resultados: Se practicó la detección sistemática en 116 SCY, de los cuales 114 tuvieron un cuestionario positivo (98%), 104 aportaron una muestra inmediata de esputo (90%) y 39 una muestra de esputo matinal (34%). De los SCY, 111 refirieron tos de >2 semanas de duración (97%). Un joven tuvo una baciloscopia de esputo positiva y recibió tratamiento hasta su curación.

Conclusión: La ejecución de una búsqueda intensiva de casos de TB es factible en los entornos de bajos recursos, por conducto de colaboraciones especiales entre los programas de atención de salud y las organizaciones comunitarias. Además de detectar los casos de TB bacilífera, el programa reveló una alta carga de morbilidad por síntomas respiratorios en los SCY en la ciudad de Eldoret, en Kenia.