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Is introducing rapid culture into the diagnostic algorithm of smear-negative tuberculosis cost-effective?

N. Yakhelef,* M. Audibert,* F. Varaine,† J. Chakaya,‡ J. Sitienei,§ H. Huerga,# M. Bonnet#

***Centre d'Etudes et de Recherches sur le Développement International, Centre National de la Recherche Scientifique, Université d'Auvergne, Clermont-Ferrand, †Médecins Sans Frontières, Paris, France; ‡Respiratory Diseases Research, Kenya Medical Research Institute, Nairobi, §¶National Leprosy and TB Control Programme, Nairobi, Kenya; #Epicentre, Paris, France**

SUMMARY

SETTING: In 2007, the World Health Organization recommended introducing rapid *Mycobacterium tuberculosis* culture into the diagnostic algorithm of smear-negative pulmonary tuberculosis (TB).

OBJECTIVE: To assess the cost-effectiveness of introducing a rapid non-commercial culture method (thin-layer agar), together with Löwenstein-Jensen culture to diagnose smear-negative TB at a district hospital in Kenya.

DESIGN: Outcomes (number of true TB cases treated) were obtained from a prospective study evaluating the effectiveness of a clinical and radiological algorithm (conventional) against the alternative algorithm (conventional plus *M. tuberculosis* culture) in 380 smear-negative TB suspects. The costs of implementing each algorithm were calculated using a 'micro-costing' or 'ingredient-based' method. We then compared the cost and effectiveness of conventional vs. culture-based algorithms and estimated the incremental cost-effectiveness ratio.

RESULTS: The costs of conventional and culture-based algorithms per smear-negative TB suspect were respectively €39.5 and €144. The costs per confirmed and treated TB case were respectively €452 and €913. The culture-based algorithm led to diagnosis and treatment of 27 more cases for an additional cost of €1477 per case.

CONCLUSION: Despite the increase in patients started on treatment thanks to culture, the relatively high cost of a culture-based algorithm will make it difficult for resource-limited countries to afford.

KEY WORDS: economic evaluation; smear-negative pulmonary; TB diagnosis; health technology assessment

TUBERCULOSIS (TB) is the most common cause of death among people living with the human immunodeficiency virus (HIV),[1] and it perpetuates poverty and inequality in low-income countries.[2–4] In 2010, 8.8 million new TB cases were reported worldwide, of whom 350 000 were among HIV-positive people.[5] In Kenya, HIV/AIDS (acquired immune-deficiency syndrome) prevalence was 6.3% in 2008–2009,[6] although this national average masks huge disparities: for example, prevalence was 13.9% in the Homa Bay District, where Médecins Sans Frontières (MSF) has been providing care since 1996. In the Homa Bay District Hospital, 68% of suspected TB cases are among HIV-infected people.[7]

Smear microscopy has low sensitivity (∼50%) compared to the *Mycobacterium tuberculosis* culture reference standard.[8] This sensitivity is even lower in HIV-infected patients.[9–11] In 2007, the World Health Organization (WHO) reviewed its diagnostic algorithms for smear-negative patients and recommended *M. tuberculosis* culture, when available, plus an earlier, systematic chest X-ray (CXR) examination.[12] However, culture requires a high laboratory infrastructure level, highly qualified staff and scrupulous respect for safety standards.[12] Due to the very poor access to *M. tuberculosis* culture testing in resource-limited settings, patients suspected of having smear-negative TB are typically diagnosed on the basis of clinical examination, CXR and absence of response to an antibiotic trial targeting bacterial pneumonias.[13] However, these diagnostic algorithms perform inadequately, leading to underdiagnosis of true TB and overtreatment of non-TB illnesses.[14]

Mycobacteria Growth Indicator Tube (MGIT) liquid culture is the most sensitive culture method; however, it is expensive and has higher safety risks than solid media.[14] Non-commercial alternatives, such as thin-layer agar (TLA) culture,[15] are based

Correspondence to: Nadia Yakhelef, Health Economics, Centre d'Etudes et de Recherches sur le Développement International, 65 bd François Mitterand, Clermont-Ferrand 63000, France. Tel: (+33) 629 417 731. Fax: (+33) 473 177 418. e-mail: nadiayakhelef@hotmail.com

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[A version in French of this article is available from the Editorial Office in Paris and from the Union website www.theunion.org] on microscopic observation of *M. tuberculosis* on agar medium. Sensitivity is close to that of the classical Löwenstein-Jensen (LJ) method, but diagnosis is faster (10–15 days vs. 30–40 days for LJ).[16–19] To improve TB diagnosis in the Homa Bay District, MSF introduced TLA and LJ culture methods into the district hospital laboratory.[20] In this setting, median time to positivity is 15 days (interquartile range [IQR] 11–21) for TLA and 23 days (IQR 18–32) for LJ.[7] This study assesses whether introduction of the rapid non-commercial TLA and LJ culture methods is cost-effective for initiating treatment in true smear-negative pulmonary TB patients.

METHODS

Diagnostic algorithms

We compared the conventional diagnostic algorithm based on clinical findings, radiological features and an antibiotic trial with a culture-based algorithm that uses TLA and LJ cultures in addition to the conventional algorithm (Appendix Figure).* Both diagnostic algorithms included several steps, after which some patients could initiate anti-tuberculosis treatment.

In the conventional algorithm, patients with CXR and/or clinical examination suggestive of TB initiated anti-tuberculosis treatment (Block A). Otherwise, they received an antibiotic trial (amoxicillin 1 g 3 times daily) for 5 days, followed by a second clinical examination and sputum microscopy examination. The decision of whether or not to start anti-tuberculosis treatment was made by the clinician (Block B), who could prescribe a second round of antibiotic treatment and perform a third clinical examination (Block C).

In the culture-based algorithm, culture was introduced from Block A for every patient. If the culture was positive and the patient had not already started anti-tuberculosis treatment, he/she was traced to initiate treatment. The remainder of the management process was the same as in the conventional algorithm (Appendix Figure).

Ethics approval

The protocol was approved by the Kenya Medical Research Institute Ethical Review Committee and the Ethical Review Committee at the *Comité de Protection des Personnes,* Saint-Germain-en-Laye, France. Before enrolment in the study, written informed consent was obtained from all study participants and from guardians of the minor participants. The written informed consent form was approved by the Ethics Committees.

*The Appendix is available in the online version of this article, at http://www.ingentaconnect.com/content/iuatld/ijtld/2014/00000018/00000005/art00010

Study population

The study included 380 patients aged ≥15 years living within a 10 km radius of the hospital, with a cough of at least 2 weeks and two negative smears. Two sputum samples per patient were collected for TLA and LJ cultures.

Cost estimation

Data collection on site started in 2011 and covered the period from September 2009 to February 2011. Cost analysis was performed from the district hospital perspective only, and did not include the cost to the patient. Cost per patient was estimated for every block of each algorithm. The number of patients in each block of the conventional and culture-based algorithms was obtained from the prospective study (Appendix Figure). Costs, both direct (i.e., resources used only by the TB diagnostic service) and joint (shared among different services), included both variable and fixed costs (depreciation of the equipment and buildings); however, costs for laboratory infrastructure incurred before the introduction of culture methods were excluded. Variable cost estimates were based on expenditures that were established a posteriori from quantities actually used (consumables, fuel, medicine, actual working time) and from prices in the Kenyan market in 2009, using a conversion rate of 108.70 KES (Kenyan shilling) for €1 (www.fxtop.com). Joint costs were calculated based upon allocation keys.

Costs for staff (clinician, nurse, laboratory technician) were calculated by either multiplying the time spent in the activity by the cost of a unit (minute) of work time or from the average number of patients per day. The work time of the laboratory technicians in charge of culture was not easily calculable; we therefore adopted the productivity approach.[21] In 2009, 1195 cultures were prepared at the laboratory, equivalent to an average of two patients tested per day (with two samples per patient) for each of three laboratory technicians. The unit cost of supervisors and maintenance workers was calculated by dividing their wages by the total number of cultures. The unit cost of the person in charge of patient tracing was estimated by dividing his/her wage by the number of people traced during the study period. For follow-up of anti-tuberculosis treatment, patients had weekly nursing consultations (6 min) during the first 2 months, followed by monthly consultations in the last 4 months. For HIV-positive persons with suspected smear-negative TB (68%),[7] there were additional medical consultations (15 min) once every 2 weeks during the first 2 months and once per month thereafter.

The material and supplies costs include the cost of treatment, CXR and laboratory equipment. The costs of the first (€0.87) and second (€4.4) courses of antibiotic treatment and anti-tuberculosis treatment (€22 for a 6-month rifampicin-based regimen) were based on a lump sum estimated by MSF. The cost of CXR was based on a lump sum of €1.84 per X-ray. The cost of small equipment and supplies for microscopy (€0.442 per blade) was based on a previous study in Kenya.[22] For culture, the cost for equipment and supplies included all medical consumables (autoclave pipettes, etc.), non-medical consumables (gas lighter, lamp, sink, etc.) and reagents.

The culture laboratory shared waste water treatment and waste management with the rest of the hospital. For running costs, we therefore allocated 4.06% of these total expenditures to the culture laboratory, using surface area as the allocation key. The investment cost included medical and non-medical equipment and depreciation of the vehicle used. For joint fixed costs, the allocation key was the proportion of activity for TB diagnosis among total hospital activity. They were allocated into three services: 10.5% for microscopy, 59.5% for laboratory equipment or the culture laboratory and 30% for the general laboratory. Based on the nomenclature used by the city of Lyon,[23] the lifetime for depreciation estimates is 10 years for laboratory equipment, 15 years for air conditioning, 7 years for refrigerators, 25 years for buildings and 3 years for motorcycles.

The total cost was estimated by adding the cost of all categories listed above according to their use in the conventional and culture-based algorithms, respectively.

Effectiveness criterion

The effectiveness criterion (screened and treated cases) was obtained from the prospective study of Huerga et al. conducted between September 2009 and February 2011.[7] The use of this indicator instead of quality-adjusted life years (QALY) is justified, as the two algorithms were analysed in the same cohort.[24] Due to delays in obtaining culture results, the effectiveness of the conventional algorithm was independently assessed in the same patients without considering the therapeutic decision based on culture results, and was estimated using culture results for the culture-based algorithm (Appendix Figure).

Economic evaluation

The diagnostic efficiency of TLA/LJ culture was estimated by calculating the incremental cost-effectiveness ratio (ICER) for using TLA/LJ in addition to the conventional algorithm, compared to the conventional algorithm (cost (cult) - cost/(result (cult) - result).[25] There were 33 patients in the conventional algorithm block, compared to 60 patients in the culture-based algorithm block. As the study was prospective, all screened *M. tuberculosis*-positive patients were traced. We also estimated potential anti-tuberculosis treatment cost savings (e.g., treatment cost * number of treated *M. tuberculosis*-negative patients) related to discontinuation of anti-tuberculosis treatment in persons with negative culture. Univariate sensitivity analysis was performed on the 1680 suspected TB cases (the total number of patients screened at the Homa Bay laboratory in 2009) and on the proportion of true TB cases identified by the culture-based algorithm and who initiated treatment after being traced. This proportion was 100% under study conditions, but close to 75% in programmatic conditions.[7] We used tracing coverage rates of 75% and 50% for the sensitivity analysis.

The cost-effectiveness thresholds recommended in the literature[26] refer to the cost per QALY, which is beyond the scope of this study. We therefore did not use a threshold, but compared the ICER of the two algorithms.

RESULTS

A total of 380 smear-negative TB suspects (median age 34 years, 65% female, 64% HIV-infected) were included in the study.[7] Following the first clinical examination and CXR, 66 patients were treated for TB and 314 were given an antibiotic trial. Among the latter, 55 initiated anti-tuberculosis treatment based on clinical and microscopy results, 2 initiated treatment based on a positive culture result that was available early, 232 were considered TB-negative and discharged and 24 patients received a second antibiotic trial (Appendix Figure). In total, 25 culture-positive patients were started on treatment after tracing (Appendix Figure).

The costing details are presented in Appendix Tables A.1 and A.2. The overall cost of care for the 380 smear-negative TB suspects was respectively €15 917 and €53 586 with the conventional and culture-based algorithms. In the conventional algorithm, the main costs were human resources (72.6%), followed by anti-tuberculosis drugs (17.6%). CXR represented only 4.7% of the total cost. With the culture-based algorithm, human resource costs represented only 39.4% of the overall cost, while the cost of materials and supplies accounted for almost half (42.9%). The average cost per screened smear-negative TB suspect was respectively €39.5 and €144.2 for the conventional and culture-based algorithms. The cost per true TB case initiating treatment was €452 using the conventional algorithm compared to €913.3 with the culture-based algorithm (Table 1). As shown by the ICER, use of culture leading to anti-tuberculosis treatment in additional true (i.e., otherwise untreated when using the conventional algorithm) TB cases accounted for additional costs of €39 890, equivalent to €1477.4 per new true TB case initiating treatment (Table 2).

Using 75% and 50% of culture-positive patients

Table 1 Cost-effectiveness of screening smear-negative TB suspects with and without TLA/LJ culture

Diagnostic algorithms	Cost Euros	Effectiveness (screened and treated cases)	CER	Cost after savings due to negative TB cultures Euros	New CER
A1 algorithm without TLA/LJ culture (n = 380)	14 917	33	452		
A2 algorithm with TLA/LJ culture, 100% of tracing coverage (n = 380)	54 807	60	913.3	48 464	807.7
A2′ algorithm with TLA/LJ culture, 75% of tracing coverage (n = 380)	53 586	52	1030.5		
A2′′ algorithm with TLA/LJ culture, 50% of coverage tracing (n = 380)	52 374	45	1163.9		
A3 algorithm without TLA/LJ culture (n = 1680)	66 881	146	451.2		
A4 algorithm with TLA/LJ culture, 100% of coverage tracing (n = 1680)	200 287	265	755.8	171 995	649
A4′ algorithm with TLA/LJ culture, 75% of coverage tracing (n = 1680)	195 309	230	849.2		
A4′′ algorithm with TLA/LJ culture, 50% of tracing coverage (n = 1680)	183 396	199	921.6		

TB = tuberculosis; TLA = thin-layer agar; LJ = Löwenstein-Jensen; CER = cost-effectiveness ratio; A = algorithm.

successfully initiated on anti-tuberculosis treatment after tracing, the average cost per screened patient was €141 and €137.8, respectively. The ICER indicates that the cost per new true TB case initiating anti-tuberculosis treatment was €2035 for a tracing coverage of 75% and €3121 for a tracing coverage of 50% (Table 2).

When the number of patients was increased to 1680, the average cost per screened patient using the conventional algorithm was €39.2 (Appendix Table A.1). Using the culture-based algorithm with tracing coverages of 100%, 75% and 50%, the average cost per screened patient was respectively €119.2, €116.2 and €109.1 (Appendix Tables A.1 and A.2). The ICER per new true TB case started on treatment was €1129.5, €1540.8 and €2217.3 with tracing coverage of respectively 100%, 75% and 50% (Table 2).

DISCUSSION

The introduction of culture into the conventional algorithm contributes to an increase in the cost of screening for smear-negative TB. Culture requires expensive equipment and many supplies, whereas the conventional algorithm depends mainly on human resources. The sensitivity analysis showed that the cost-effectiveness ratio of the culture algorithm will improve if we quadruple (depending on availability of laboratory resources) the number of screened patients, regardless of coverage rates for tracing. The additional cost per true TB case initiating treatment with a tracing rate of 100% is not excessive (€1477) compared to the average cost (€913); this remains true when the tracing rate decreases to 75%. In the absence of a threshold reference, this cost might represent the community's willingness-to-pay for saving one additional life. The stake is to know if the community is ready to pay about 40% more than the mean cost. In addition, it may require a budget impact analysis. The total cost for the diagnosis of presumed smear-negative TB increased from €14 917 (without culture) to €54 807 (with culture), which would require to multiplying the amount of financial resources by 3.5 or 4.

Adoption of the 2007 WHO revised algorithm on a national scale would require the creation of several laboratories with a high level of infrastructure and staff with expertise.[12] It is therefore important to first ensure that the introduction of culture is consistent with financial sustainability and affordability in the medium and long term.

Cost-effectiveness studies of TB diagnostic algorithms incorporating culture methodologies in resource-limited countries are relatively scarce,[15] and we know of none pertaining to TLA. Moreover, comparisons are difficult, as studies do not always assess the same effectiveness outcome.[27] In a study in Zambia, Mueller et al. found a cost per detected case

Table 2 Incremental cost-effectiveness ratio

Algorithm	Costs Euros (C)	Screened and treated cases (E)	ΔC	ΔE	ICER	Cost after savings due to negative TB cultures Euros	New ΔC	New ICER
A1	14 917	33	14 917	33	452			
A2	54 807	60	39 890	27	1477.4	48 464	33 547	1242.4
A2′	53 586	52	38 669	19	2035.2			
A2"	52 374	45	37 457	12	3121.4			
A3	65 881	146	65 881	146	451.2			
A4	200 287	265	134 406	119	1129.5	171 995	106 114	891.7
A4′	195 307	230	129 428	84	1540.8			
A4"	183 396	199	117 515	53	2217.3			

TB = tuberculosis; ICER = incremental cost-effectiveness ratio; A = algorithm.

of €134 with MGIT culture and €231 with LJ;[28] for smear-negative TB suspects, the cost was €413 with MGIT. A study conducted in three settings (India, Uganda and South Africa) found a cost per detected case with Xpert® MTB/RIF (Cepheid, Sunnyvale, CA, USA) of €109 in India, €99.5 in South Africa and €109 in Uganda.[29] These costs are lower than our estimations, but their base case scenario was different (without CXR), and comparisons are difficult.

Use of culture contributed to 27 patients initiating treatment (45% of all confirmed TB patients), who were missed by clinical and radiological diagnosis. However, except for two (Appendix Figure), *M. tuberculosis* culture required effective tracing of culture-positive patients. The time to obtain culture results limits the impact of culture on the therapeutic decision. Despite negative *M. tuberculosis* culture, 78 patients initiated anti-tuberculosis treatment based on clinical and radiological findings. The use of *M. tuberculosis* culture did not reduce the number of patients wrongly treated based on clinical and radiological findings, as empirical anti-tuberculosis treatment was not stopped despite negative culture results, according to national guidelines. Some patients would have benefited from the discontinuation of treatment. However, knowing that *M. tuberculosis* is an imperfect TB reference standard, as patients with active TB can be culture-negative, in a resource-limited context, it might be difficult to decide who should stop empirical treatment, particularly in patients with good clinical response. The impact on negative culture results on the management of patients empirically started on anti-tuberculosis treatment merits further research. If the culture results had been faster, this would have averted costs of €6343 for 380 patients in the cohort. Cost-effectiveness would have improved from €913.3 to €807.7 (Table 1) and the ICER from €1477.4 to €1242.4 (Table 2). With the number of patients increased to 1680, the savings would be €28 292, the cost-effectiveness ratio would improve (€649 instead of €755.8) and then the ICER would be €891.7 instead of €1129.5.

A test with the same sensitivity as culture, but much faster, would be more cost-effective. Among currently available tests, the Xpert assay comes closest to this ideal, with a sensitivity of 70% in smear-negative TB suspects compared to culture, and results available in 2 h.[30] This test also has the advantage of requiring infrastructure and expertise close to those required by microscopy.[31]

CONCLUSION

This study is one of very few that documents the cost-effectiveness of a diagnostic algorithm for smear-negative pulmonary TB using rapid culture for *M. tuberculosis* in a district hospital in an area with high HIV prevalence and limited resources. Using TLA/LJ in addition to the conventional algorithm made it more expensive, although its cost-effectiveness would improve if the number of screened patients increased. The decision to adopt rapid culture for *M. tuberculosis* depends on the government/community's willingness to pay for it.

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APPENDIX

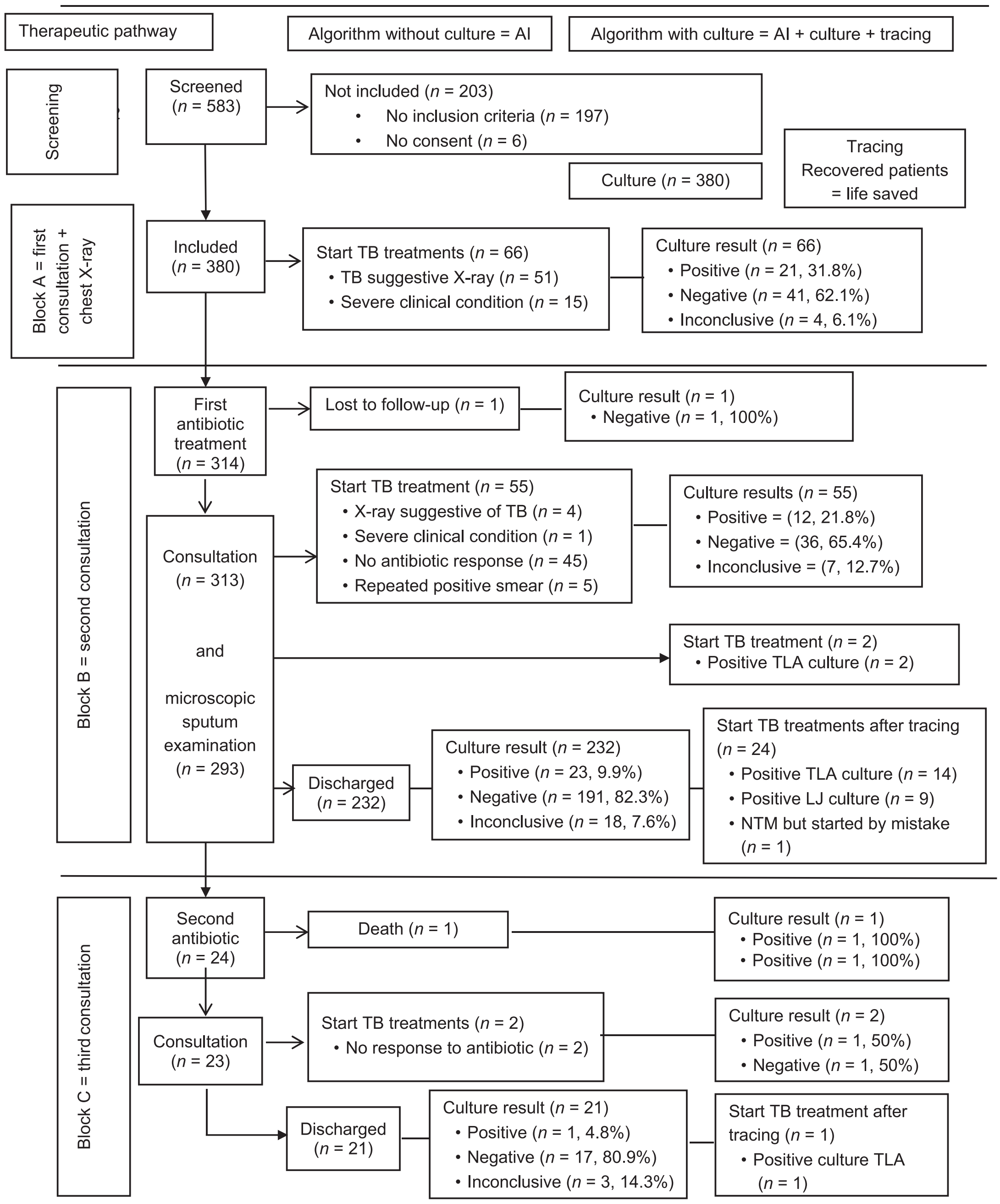

Figure Diagnostic and treatment pathway for smear-negative TB suspects (prospective study, $n = 380$), with and without *M. tuberculosis* culture. TB = tuberculosis; TLA = thin-layer agar; NTM = non-tuberculous mycobacteria.

Table A.1 Cost components of screening (tracing = 100%), with and without TLA/LJ culture, 2009

	Algorithm			
Cost components	Without TLA/LJ culture (*n* = 380) Euros (%)	With TLA/LJ culture (*n* = 380) Euros (%)	Without TLA/LJ culture (*n* = 1680) Euros (%)	With TLA/LJ culture (*n* = 1680) Euros (%)
Staff	10 833 (72.6)	21 617 (39.4)	47 850 (72.6)	66 266 (33.1)
Staff training	0 (0)	117 (0.2)	0 (0)	184 (0.1)
Chest X-ray	695 (4.7)	695 (1.3)	3075 (4.7)	3075 (1.5)
Antibiotic treatment	372 (2.5)	373 (0.7)	1644 (2.5)	1664 (0.8)
Functioning	41 (0.3)	1943 (3.5)	181 (0.3)	3199 (1.6)
Material and furniture	302 (2.0)	23507 (42.9)	1333 (2.0)	104106 (52)
Medical equipment	20.4 (0.1)	1864 (3.4)	91 (0.1)	2997 (1.5)
Non-medical equipment	34 (0.2)	269 (0.5)	151 (0.2)	2212 (1.1)
Anti-tuberculosis treatment	2619 (17.6)	3176 (5.8)	11 557 (17.7)	14 134 (7.1)
Infrastructure	0 (0)	1082 (2.0)	0 (0)	1707 (0.9)
Motorcycle depreciation	0 (0)	104 (0.2)	0 (0)	472 (0.2)
Motorcycle maintenance	0 (0)	60 (0.1)	0 (0)	271 (0.1)
Total	14 917	54 807	65 881	200 287
Cost per patient, euros	39.5	144.2	39.2	119.2

TLA = thin-layer agar; LJ = Löwenstein-Jensen.

Table A.2 Cost components of screening (tracing = 75% and 50%) with and without TLA/LJ culture, in Euros and (%), 2009

	Algorithm			
	75% tracing		50% tracing	
Cost components	With TLA/LJ culture (*n* = 380) Euros (%)	With TLA/LJ culture (*n* = 1680) Euros (%)	With TLA/LJ culture (*n* = 380) Euros (%)	With TLA/LJ culture (*n* = 1680) Euros (%)
Staff	20 938 (39.1)	64 113 (32.8)	20 493 (39.1)	55 137 (30.1)
Staff training	116 (0.2)	181 (0.1)	113 (0.2)	178 (0.1)
Chest X-ray	686 (1.3)	3021 (1.5)	673 (1.3)	2968 (1.6)
Antibiotic treatment	373 (0.7)	1634 (0.8)	358 (0.7)	1592 (0.9)
Functioning	1917 (3.6)	3141 (1.6)	1880 (3.6)	3083 (1.7)
Material and furniture	23 192 (43.3)	102 340 (52.4)	22 750 (43.4)	100 511 (54.8)
Medical equipment	1839 (3.4)	2946 (1.5)	1804 (3.4)	2892 (1.6)
Non-medical equipment	265 (0.5)	2172 (1.1)	259 (0.5)	2131 (1.2)
Anti-tuberculosis treatment	3066 (5.7)	13 522 (6.9)	2912 (5.6)	12 883 (7.3)
Infrastructure	1067 (2.0)	1679 (0.9)	1047 (2.0)	1649 (0.9)
Motorcycle depreciation	83 (0.2)	356 (0.2)	54 (0.1)	236 (0.1)
Motorcycle maintenance	47.5 (0.1)	205 (0.1)	31 (0.1)	136 (0.1)
Total	53 586 (100)	195 309 (100)	52 374 (100)	183 396 (100)
Cost per patient	141.0	116.2	137.8	1109.2

TLA = thin-layer agar; LJ = Löwenstein-Jensen.

RESUME

CONTEXTE : En 2007, l'Organisation Mondiale de la Santé a recommandé la réalisation de la culture rapide de *Mycobacterium tuberculosis* dans l'algorithme de diagnostic de la tuberculose (TB) pulmonaire à frottis négatif.

OBJECTIF : Evaluer le rapport coût-efficacité de l'introduction d'une méthode de culture non commerciale rapide (culture sur milieu agar en fine couche, TLA) et de la culture de Löwenstein Jensen pour diagnostiquer la TB chez les patients à frottis négatif dans un hôpital de district au Kenya.

SCHÉMA : Les résultats d'efficacité (nombre de vrais cas de TB traités) ont été obtenus à partir d'une étude prospective évaluant l'efficacité d'un algorithme clinique et radiologique (conventionnel) contre un algorithme alternatif (conventionnel plus culture *M. tuberculosis*) chez 380 patients avec suspicion de TB à frottis négatif. Les coûts de chaque algorithme ont été calculés en utilisant la méthode de la micro-évaluation des coûts ou « basée sur les ressources ». Nous avons ensuite comparé le coût et l'efficacité des algorithmes conventionnel et conventionnel + culture, et estimé le rapport différentiel coût-résultats.

RÉSULTATS : Les coûts des algorithmes conventionnel et conventionnel + culture étaient respectivement de 39,5€ et 144€ par patient suspect de TB à frottis négatif. Les coûts par cas de TB confirmée et traitée étaient 452€ et 913€, respectivement. L'algorithme basé sur la culture a permis de diagnostiquer et traiter 27 patients en plus, pour un coût supplémentaire de 1477€ par patient.

CONCLUSION : Malgré l'augmentation du nombre de patients traités grâce à la culture, le coût relativement élevé de l'introduction de la culture dans l'algorithme diagnostique de la TB en limite son application pour les pays à ressources limitées.

RESUMEN

MARCO DE REFERENCIA: En el 2007, la Organización Mundial de la Salud recomendó la introducción del cultivo rápido de *Mycobacterium tuberculosis* en el algoritmo diagnóstico de la tuberculosis (TB) con baciloscopia negativa.

OBJETIVO: Evaluar la rentabilidad de la introducción de un método de cultivo rápido no comercial (agar de capa delgada) al mismo tiempo que el cultivo en medio de Löwenstein Jensen, en el diagnóstico de la TB con baciloscopia negativa en un hospital distrital en Kenia.

MÉTODO: Se tomaron los resultados de un estudio prospectivo (número de casos verdaderos de TB tratados) que evaluaba la eficacia de un algoritmo clínico y radiográfico (clásico) y se compararon con el algoritmo propuesto (clásico más cultivo de *M. tuberculosis*) en 380 pacientes con presunción diagnóstica de TB con baciloscopia negativa. Se calculó el costo de la aplicación de cada algoritmo mediante un método de 'microcostos' o 'con base en los insumos'. Se comparó luego el costo y la eficacia de los algoritmos clásicos y los algoritmos basados en cultivos y se calculó la tasa de rentabilidad adicional.

RESULTADOS: El costo por cada caso de presunción de TB con baciloscopia negativa investigado mediante el algoritmo clásico fue 39,5€ y con el algoritmo de cultivos fue 144€. Los costos por cada caso confirmado de TB y tratado fue 452€ en el marco del algoritmo clásico y 913€ con el algoritmo basado en los cultivos. El algoritmo propuesto con cultivos permitió el diagnóstico y tratamiento de 27 casos más, con un costo adicional de 1477€ por caso.

CONCLUSIÓN: Pese al aumento del número de pacientes que comienzan tratamiento gracias al cultivo, el alto costo de un algoritmo basado en este método estaría fuera del alcance en los países con recursos limitados.