Early Detection and Integrated Management of Tuberculosis in Europe

PJ-03-2015
Early diagnosis of tuberculosis

D3.2
Evaluation of Screening in Romania

WP 3 – Evaluation

Due date of deliverable	Month 54 – November 2020
Actual submission date	30th September 2020
Start date of project	3 May 2016
Duration	54 months
Lead beneficiary	UCL
Last editor	Ibrahim Abubakar and Lara Goscé (UCL)
Contributors	IA
Dissemination level	*Public (PU)*

This project E-DETECT TB has received funding from the European Union's Health Programme (2014-2020) under grant agreement N°709624.

History of the changes

Version	Date	Released by	Comments
0.1	30/09/2020	Ibrahim Abubakar	First version for submission: subject to further update

Table of contents

Definitions and acronyms

Acronyms	Definitions
TB	Tuberculosis
LTBI	Latent Tuberculosis Infection

Table of Figures

1. Introduction

1.1. General context

The E-DETECT Tuberculosis (TB) consortium is a European Commission co-funded group which brings together world leading TB experts in national public health agencies (Sweden, United Kingdom, Dutch, Italy and Romania), with industry (Delft diagnostics) and major academic centres (UCL, Karolinska, SMI, OSR, UNIBS). The composition of the consortium also reflects the incidence of TB in different European countries.

The overall objective of the consortium is to contribute to a decline, and the eventual elimination of TB, in the EU. Specific objectives include:

1. To ensure **early diagnosis** in vulnerable populations- defined as **homeless individuals, Roma, those with a history of drug use** within the **community, and prisoners-** in two high incidence European countries (Romania and Bulgaria). This will be done by an outreach mobile digital x-ray screening van equipped with automated x-ray reading equipment and rapid molecular diagnostics.
2. To evaluate approaches to consolidate **migrant TB detection** and improve European **cross-border management** by:
    a. producing new feasibility data on **early detection and care integration** in individuals arriving via the Mediterranean sea in Italy using innovative molecular testing at immigration
    b. collating, analysing and evaluating multi country data on TB in **migrants** to low incidence countries to inform effective strategies for **early diagnosis** of active and latent TB in low incidence EU countries (Work Package [WP] 6).
    c. ensuring **cross-border** transfer of information and referral of patients, especially migrants dispersed through EU coordinated activity and patients with multi-drug resistant TB (WP 5 and 6).
3. To support the development of action plans in member states by taking best practice approaches from countries where E-DETECT TB partners have developed national and international strategies and evidence from this project and providing a framework, in

collaboration with ECDC, to support the adaptation and implementation of these measures across other EU member states.

Successful delivery of all programmes should result in a substantial impact on EU TB incidence; we are aiming to reduce the overall European incidence reducing the number of cases annually from about 67,000 to 54,000 over the programme implementation period and beyond due to earlier detection and integrated care in high-risk groups.

1.2. Deliverable objectives

The main objective of this deliverable is to undertake a cost-effectiveness analysis to inform an economic evaluation of the programme and assess value for money. The objective of the cost effectiveness analysis is the estimation of the cost per case of active TB detected.

2. Methodological approach

The project planned outreach-screening services in Romania with digital chest X-rays (CXRs) plas a molecular point of care test, GeneXpert. A team of a driver, radiographer, TB nurse, social worker, and a peer group member performed the screening. All abnormal CXRs and 10% of the normal CXRs detected by CAD4TB (1,400 per year in total) were read by Romanian radiologists/chest physicians. National and international/external technical assistance provided.

A deterministic compartmental model was created to study transmission of TB in the homeless population in Bucharest. The model distinguishes between early (<5 years) and late (>5 years) LTBI (latent TB infections), active TB cases are divided among undetected, detected untreated and detected under treatment, recovered individuals can be reinfected. The whole pathway of infection is described in Figure 1.

The model was parametrised sourcing values from the WHO 2015 Global TB report, picking lower boundary values for detection and treatment rates assuming these have lower values in the homeless population compared to the general population. The model was fitted to detected TB cases in Bucharest from 2014 to 2018 as shown in Figure 2.

Cost data as estimated in the study can be found in Table 1.

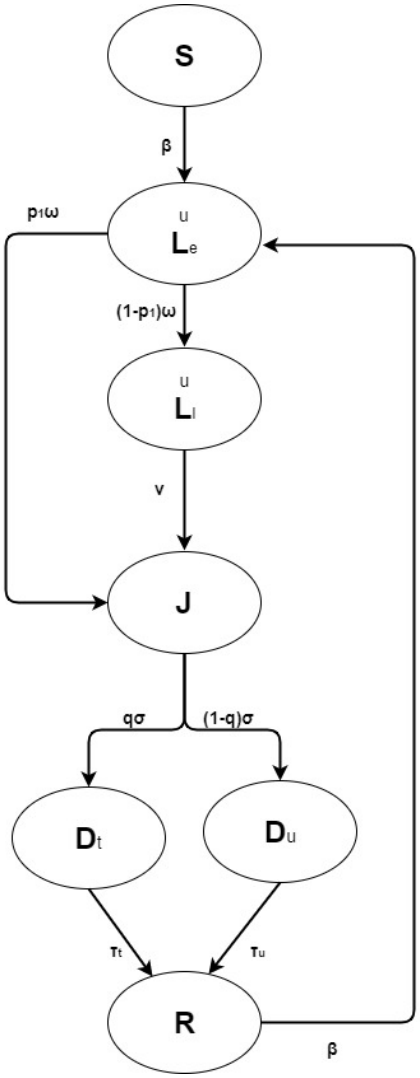

Figure 1 – Model schematic. Individuals are initially susceptible (S), following contagion they enter the early latent (Le) compartment where they can develop active TB at a probability pω or remain up to 5 years, following which they move to the late latent (Ll) compartment. In this compartment infected individuals can still reactivate into active TB with a probability v or remain their whole life. Active TB cases are initially undiagnosed (J) and can be detected at a rate σ, following which they can either initiate treatment according to a probability q (Dt) or remain untreated (Du). Following recovery (R) (at a rates τt and τu), people can be reinfected and restart the cycle from Le.

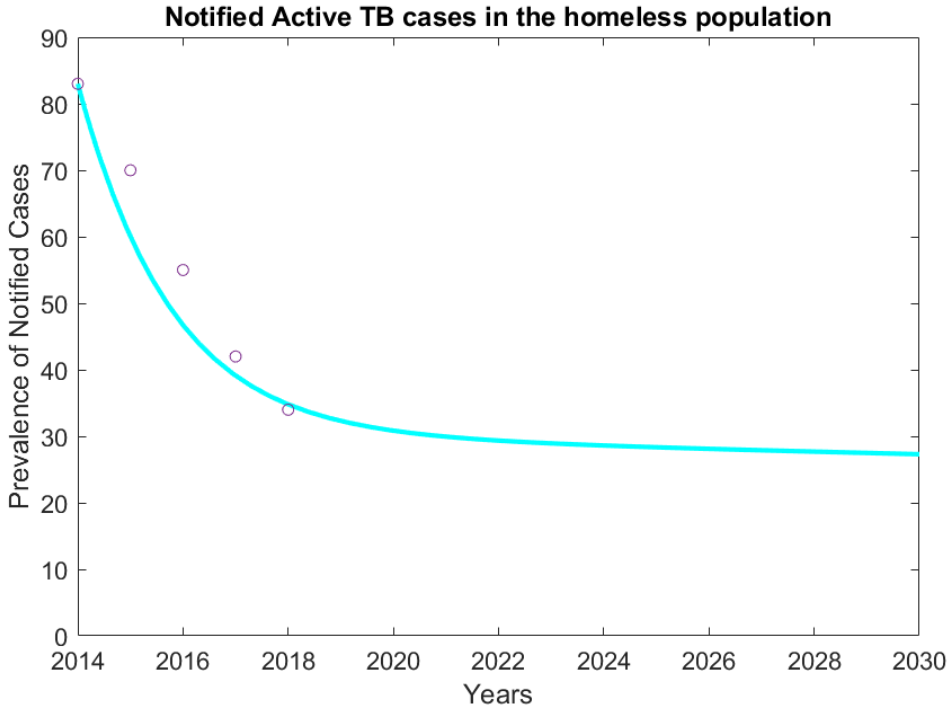

Figure 2 – Model fit to 2014-2018 incidence of notified cases in the homeless population in Bucharest.

Table 1 – Cost data

Staff function	Sum Cost (€)
Project coordinator	14,400.00
Data Manager	7,200.00
Head NTP programme	8,590.91
Finance & Procurement officer	1,920.00
Driver	10,000.00
TB Nurse	10,000.00
Radiographer	10,000.00
Outreach/social worker	9,600.00
Peer group member	1,689.60
Pulmonologist/radiologist	5,727.27
Travel	26,500
Equipment	320,954
Other goods and services	480,380
Indirect costs	63,487
Total	970,449

3. Summary of activities and research findings

During the study period 7 additional cases of active TB, which correspond to around 20% of yearly incidence, were detected, resulting in a cost per case of 138,363€. This result should be considered in the wider context of long-term impact of the strategy. Projecting modelling results up to 2030 we can see that a 20% increase in detection rate leads to 18% decrease in incidence and 10% decrease in prevalence by 2030. Furthermore, a 40% increase in detection rate leads to a 30% decrease in incidence and 15% decrease in prevalence by 2030 (Figure 3).

Moreover, outreach screening positively affects treatment initiation and completion (Jit, 2011), modelling results show that a 20% increase in detection rate combined with 95% treatment rate lead to 18% decrease in incidence and 20% decrease in prevalence by 2030. Furthermore a 40% increase in detection rate combined with 95% treatment rate lead to a 30% decrease in incidence and 24% decrease in prevalence by 2030 (Figure 4).

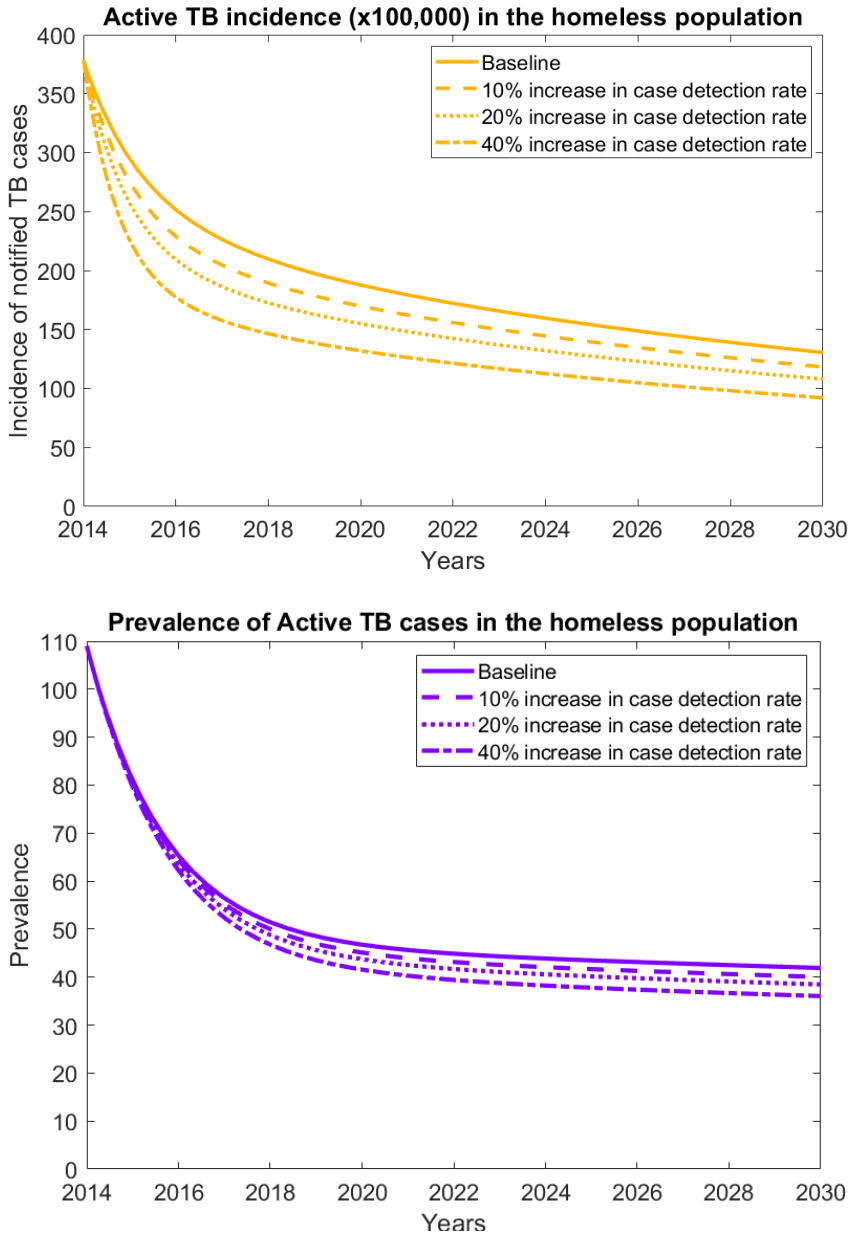

Figure 3 – Incidence and prevalence of active TB with different levels of detection.

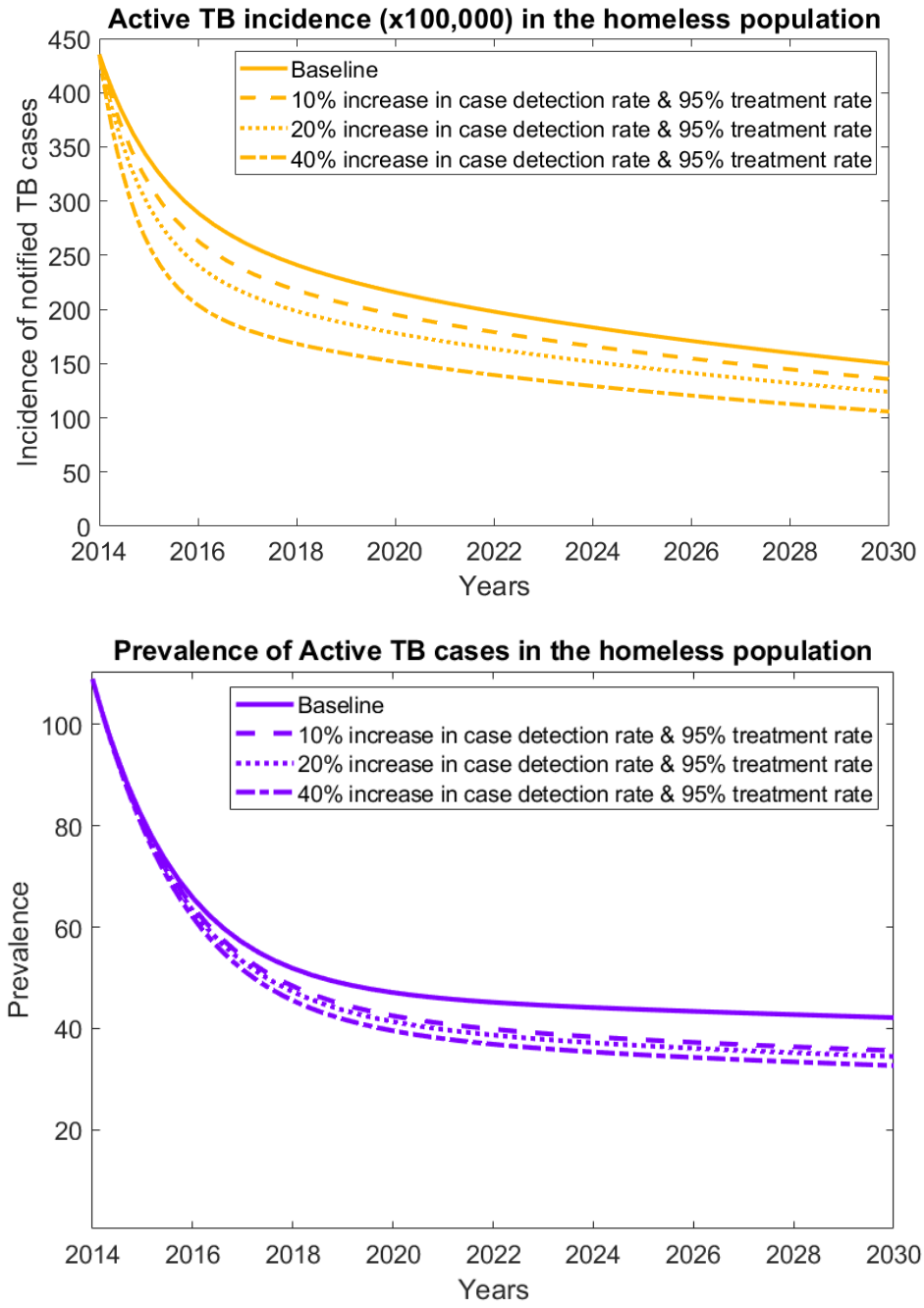

Figure 4 – Incidence and prevalence of active TB with different levels of detection.

4. Conclusions and future steps

In this work we calculated the cost per active TB case detected through outreach screening services in Romania. A modelling analysis was performed to study the long-term epidemiological consequences of the strategy on Bucharest homeless population.

Future work should update this analysis with data from Procul4 (the new project which will continue with mobile active case finding programme in Romania) as well as estimate the cost for quality adjusted life year.

5. Publications resulting from the work described

None but there will be peer reviewed publications

6. Bibliographical references

- World Health Organization. (2015). Global tuberculosis report 2015, 20th ed. World Health Organization. https://apps.who.int/iris/handle/10665/191102

- Jit, M., Stagg, H.R., Aldridge, R.W., White, P.J. and Abubakar, I., 2011. Dedicated outreach service for hard to reach patients with tuberculosis in London: observational study and economic evaluation. Bmj, 343.