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Report of the joint WHO and ECDC programme review of the national TB control programme in the Netherlands

30 September–4 October 2013

ABSTRACT

At the request of the Centre for Infectious Disease Control of the National Institute of Public Health and the Environment and the KNCV Tuberculosis Foundation, the WHO Regional Office for Europe and the European Centre for Disease Prevention and Control conducted a review of the national TB prevention and control strategies and activities of the Netherlands. The particular focus was on reviewing the progress made in implementing the recommendations of the previous international review in 2008, advising on the scale and quality of laboratory TB services, reviewing and advising on the human resource component of the TB public health services and on screening and contact investigation policies and practices, including those for migrants. The review produced specific recommendations that will enable relevant country stakeholders to further improve current TB prevention and control strategies and interventions.

Keywords

DELIVERY OF HEALTH CARE
PROGRAM EVALUATION
PUBLIC HEALTH
TUBERCULOSIS
TUBERCULOSIS, MULTIDRUG-RESISTANT

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Abbreviations

BCG	bacillus Calmette-Guérin
BSL III	biosafety level 3
CCKL	Coordination Committee for Quality Assurance for Health Care Laboratories
ECDC	European Centre for Disease Prevention and Control
GGD	municipal public health services
KNCV	KNCV Tuberculosis Foundation
MDR	multidrug-resistant
RIVM	National Institute of Public Health and the Environment
SMART	specific, measurable, attainable, relevant and time-bound
TB	tuberculosis
XDR	extensively drug-resistant

Introduction

At the request of the Centre for Infectious Disease Control of the National Institute of Public Health and the Environment (RIVM) and the KNCV Tuberculosis Foundation, the instructions of the WHO Regional Director for Europe and the instructions of the director of the European Centre for Disease Prevention and Control (ECDC), the WHO Regional Office for Europe Tuberculosis and Multidrug- and Extensively Drug Resistant Tuberculosis (M/XDR-TB) programme and the ECDC Tuberculosis Disease Programme jointly conducted an external review of the national TB control programme in the Netherlands with specific attention to the scale of laboratory services, human resources in the TB prevention, care and control sector and screening and contact investigation policies and practices. The Netherlands has a low TB incidence, with a TB notification rate of less than 10 per 100 000 population per year (elimination phase). The previous TB review in the Netherlands was carried out in 2008.

Terms of reference

The terms of reference of the review were:

- to review and advise on the scale of laboratory TB services, especially in relation to the quality;
- to review and advise on the governance and human resource component of the public health TB services;
- to review and advise on screening and contact investigation policies and practices, including for migrants; and
- to review the progress made on the recommendations of the international review in 2008.

Process

With the assistance and coordination of RIVM and KNCV and after agreeing on the terms of reference and a preparatory teleconference call, the mission members conducted the mission from 30 September to 4 October 2013. The mission members included:

- Masoud Dara, programme manager, TB and M/XDR-TB, WHO Regional Office for Europe, team leader;
- Marieke van der Werf, Senior Expert and Head of the TB Programme, ECDC;
- Martin van den Boom, technical officer, TB and M/XDR-TB, WHO Regional Office for Europe;
- Szabolcs Szigeti, technical officer, TB and M/XDR-TB, WHO Regional Office for Europe;
- Andreas Sandgren, expert in TB, ECDC;
- Karin Rønning, temporary adviser, ECDC;
- Troels Lillebæk, temporary adviser, ECDC; and
- Ximena Gonzalo, temporary adviser, ECDC.

In preparation of the review, the national counterparts organizing the review in the Netherlands provided useful documents that were made available to mission members on a share-point site. These were assessed by the team members, and the information provided in them was used in developing the summary and this comprehensive report.

The mission reviewed technical reports, surveillance data, national reports and epidemiological data, assessed the various aspects of the TB programme, interviewed health care personnel in hospitals, ambulatory care units and TB laboratory services in the public and private sectors and participated in a round-table meeting with delegates from professional associations.

An overview of progress in implementation of previous TB country review recommendations by key areas

Annex 3 provides a detailed description.

- *Organization*

  Most recommendations have been implemented or are in progress (implementation initiated and ongoing).

- *Performance and organization of TB service delivery*

  Most of the suggested actions have been implemented or are in progress, but some challenges remain in distributing and defining roles.

- *Active case-finding and outbreak management*

  Most suggested actions have been partly implemented or/and are in the process of being implemented.

- *Laboratory services*

  The number of laboratories has not been reduced significantly. There have been improvements in laboratory safety, accreditation and external quality assurance systems, but these are not implemented systematically, and challenges remain in relation to laboratory structure, such as the number of laboratories and recognition of a national reference laboratory.

- *Surveillance, monitoring and evaluation*

  Roles and responsibilities have been clarified, but the surveillance system is not fully interlinked yet.

Epidemiology of TB in the Netherlands

In the past decade, the TB burden has further decreased. The TB notification rate has decreased from about 8 per 100 000 population in 2003 to 5.7 per 100 000 in 2012 (40.3 per 100 000 among people born outside the Netherlands and 1.5 per 100 000 among people born in the Netherlands). Since 2002, TB treatment outcomes have been favourable, with an overall stable treatment success rate exceeding 80%. However, in 2012, an MDR-TB treatment success rate of 64% was reported.

There is some heterogeneity in the TB epidemic with regards to the mean age and nationality of TB cases: in 2012, 73.2% of all TB cases were born outside the Netherlands, and the mean age

of new TB cases among people born in the Netherlands was 45.6 years, whereas the mean age of new TB cases among people born outside the Netherlands was 39.5 years.

For people living with HIV, regular (follow-up) consultations and isoniazid preventive therapy is provided. HIV-positive status is considered a criterion for being in a TB risk group. About 42% of the people with TB (total number in 2012 was 958) are tested for HIV.

The culture confirmation rate (all TB cases) has fluctuated between about 76% in 2001 and 69% in 2012 (pulmonary TB cases above 85% in 2012). The exact number of laboratories culturing *Mycobacterium tuberculosis* complex strains is unknown. According to the Health Care Inspectorate, the number is 33, whereas according to RIVM, the number is 40.

Key findings and recommendations by area

Organization of laboratory services

The specific terms of reference for organizing the laboratory services were:

- to review and advise on the scale of laboratory TB services, especially in relation to the quality, "anticipating a further decline in the number of TB cases" and "increased pressure on human and financial resources"; and
- to review the progress made on the recommendations of the international review in 2008.

It is remarkable that the exact number of laboratories culturing *M. tuberculosis* complex strains in the Netherlands is not known. According to the Health Care Inspectorate, the number is 33, whereas according to RIVM, the number is 40.

Based on the Health Care Inspectorate data – which were based on a not yet published questionnaire survey and inspection of 8 laboratories – the 33 laboratories culturing *M. tuberculosis* complex strains all have BSL III (biosafety level 3) facilities, "CCKL accreditation" and participate in "quality assurance schemes". Seven of these laboratories perform culture-based drug susceptibility testing. In total, they handle about 62 000 specimens annually, but some laboratories only see four positive cultures per year and some laboratories examine specimens from less than 10 people per year in total. Further, it is unclear from the results of the questionnaire survey whether the negative pressure is routinely measured and registered in all 33 BSL III laboratories included in the questionnaire survey.

According to the RIVM, not all genotypically based diagnosis and drug susceptibility testing results are subsequently culture verified. After RIVM introduced payment for drug susceptibility testing, the rate of culture-based drug susceptibility testing verification by the national reference laboratory dropped. Regional and local laboratories should participate in quality control.

During this review, six laboratories were visited. The laboratories visited were well organized and had the adequate biosafety level for the work they were performing. No competency records were available during the visits, but it was stated that all personnel handling *M. tuberculosis* complex cultures were trained in safety issues regarding the tasks they were performing. Regarding specific technical training, some techniques were regularly assessed, whereas others, such as microscopy, were not systematically evaluated if they were evaluated at all.

It was noted that most laboratories visited – if not all – used "in-house" polymerase chain reaction techniques rather than the commercially available internationally recommended methods. Further, it was unknown whether all laboratories in the country use liquid media or whether some laboratories use solid media only.

In one laboratory visited, it was mentioned that this new and modern BSL III facility was used about 1.5 hours per day handling 4000–5000 specimens per year. Nevertheless, a new BSL III laboratory for mycobacteria diagnosis was in the planning phase in the same region.

There is no official laboratory network in place in the Netherlands, and no official national reference laboratory has been recognized.

There are guidelines about good laboratory practice and mycobacteria diagnosis, but each individual laboratory is free to decide how they implement their services, including which tests they offer and which accreditation scheme they follow. This explains the diversity in methods, many of them "in-house". One laboratory visited adhered to two international external quality assurance schemes for all the methods in place; another only assessed certain methods and only by a national scheme.

No internal quality control schemes were in place. External quality control schemes included the Netherlands' own scheme plus various international ones such as the United Kingdom National External Quality Assessment Service, but not all methods and techniques were included in the schemes.

Key findings

- The number of laboratories performing TB diagnostic tests is still disproportionately high.
- Quality assessment schemes are not systematically implemented.
- There is still no official national reference laboratory and no mycobacteria diagnosis network.
- There are readily available diagnostic guidelines, but it is a local decision to follow them or not.
- Training is not clearly organized, and competence is not delineated.
- Regarding safety, it seems that most laboratories performing *M. tuberculosis* complex cultures have BSL III facilities, although it is uncertain how many laboratories adhere to all the procedures required for BSL III. The laboratories visited comply with biosafety regulations.
- The quality control programmes have no systematic approach to quality. External quality assurance is available for certain techniques but not for others. Internal quality assurance was not in place in all the laboratories visited.
- Training is organized for safety aspects of *M. tuberculosis* diagnosis but not necessarily for technical aspects of the work.
- There is no systematic approach for reporting laboratory results to the person or facility requesting the tests. There are local arrangements with users, but it is up to the parties to establish the communication channels. No guidelines about reporting are available and also no agreement on acceptable turnaround times.

Recommendations

- Culturing and drug susceptibility testing for *M. tuberculosis* complex strains should only take place in a few nationally and internationally quality assured BSL III facilities. The quality assurance should include:
  - guidance on the minimum number of specimens processed to maintain high quality and, at the same time, be cost-effective;
  - mandatory accreditation (quality management system) of an international standard, such as ISO 15189:2012 *(1)*;
  - regular internal and external quality control schemes, preferably with accessible results available in the public domain *(2)*; and
  - guidance on BSL III standards *(2,3)*, including regular inspection and accreditation visits in all BSL III facilities.
- A formal laboratory network structure should be established between a national reference laboratory and the few regional laboratories, and local laboratories, clearly stating which tests are performed at which level (local, regional and national), to optimize TB diagnosis. The following should apply in this network.
  - A suitable high-quality laboratory should be recognized as the national reference laboratory (such as the currently acting one), to head the network and provide guidance on methods and optimizing diagnostic procedures.
  - Duties and responsibilities within the network should be clearly specified.
  - Important information from the national reference laboratory should transparently reach the Ministry of Health, Welfare and Sport.
  - A suggestion for diagnostic structure could be: (a) local level: microscopy and commercially available polymerase chain reaction for species identification; (b) regional level: addition of culture, genotypic drug susceptibility testing and phenotypic drug susceptibility testing for first-line drugs; and (c) national reference laboratory: addition of phenotypic drug susceptibility testing for second-line drugs and verification of "resistance" found at other levels.
- For timely delivery of results, the first positive culture from any new person with TB should immediately (the same day) be sent to the national reference laboratory for genotyping and, if any resistance is reported, phenotypic drug susceptibility testing verification *(4)*, including that previously detected by molecular methods. In addition:
  - TB diagnosis based on nucleic acid testing results only should always be confirmed by culture *(4)*;
  - turnaround time for all diagnostic tests performed should be agreed on, put in writing and monitored.

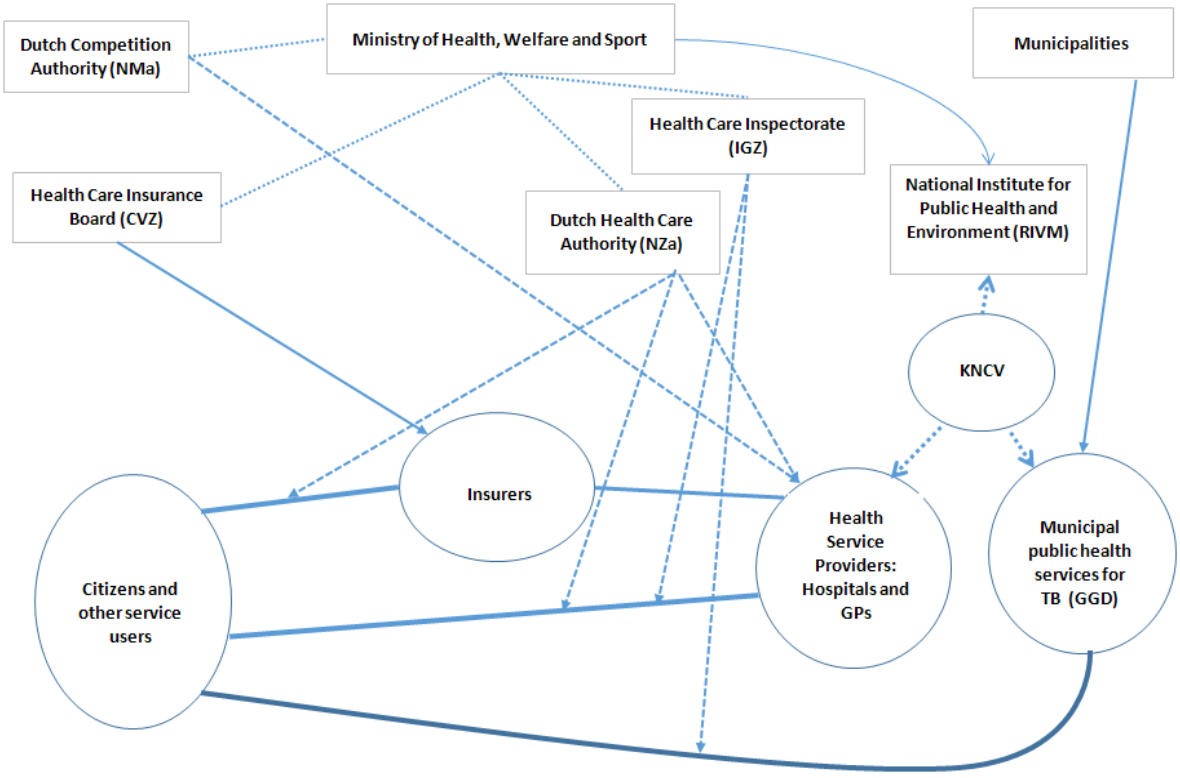
Governance and human resources

Key findings

The current overall governance and organization model of the health system in the Netherlands is based on the managed competition in the health insurance and provider markets *(5–8)* (Fig. 1). The reforms introduced in 2006 changed fundamentally the role of the government from directly

controlling volumes, prices and capacities into overseeing the market competition and safeguarding the standards of the health care and insurances *(9)*. Based on the principle of subsidiarity, the responsibilities for providing and financing care were transferred to insurers, providers, local governments, and citizens. At the same time, professional associations are playing an active role in quality improvement and in developing professional guidelines. The Ministry of Health, Welfare and Sport is using four quasi-independent regulatory agencies for selected functions of health governance, such as the Dutch Health Care Authority to supervise relationships in all health care markets and to impose tariff and performance regulation, Dutch Competition Authority to enforce the prohibition for the abuse of dominant market position in any health care market, Health Care Insurance Board to manage the Health Insurance Fund and the General Fund for Exceptional Medical Expenses and to advise the Ministry of Health, Welfare and Sport on the basic benefit package, finally the Health Care Inspectorate to supervise quality and accessibility of health care including investigating patient's complaints *(9,10)*.

Fig. 1. Organizational chart of TB prevention and control in the Netherlands from a health system perspective



In the approach of the Public Health Act for the service delivery model for TB that partly integrates prevention and treatment, the emphasis lies on the municipal public health services (GGD) that are primarily responsible for TB control by screening risk groups and conducting contact tracing as well as treating people with TB. These activities are managed by the close support of TB doctors, nurses and assistants employed by the GGDs (municipal public health services). In particular, GGDs are working closely together with specialists in hospitals and with microbiology laboratories. There are 26 GGDs, all of which have a kind of TB department; some are served with mobile X-ray units. Not all TB departments have TB doctors, but they may hire one from the back office GGD.

The long-term vision of the stakeholders, which is formulated in the National Tuberculosis Control Plan that discusses the optimal organizational arrangements for the upcoming years *(11)*, reaffirmed this service delivery approaches along with suggested changes for regionalization in 2011, which means more centralization in the provision of care by the GGDs to secure quality and efficiency at diminishing the number of people with TB *(11)* (see more in the section on service delivery).

In accordance with the overall health governance model, the Ministry of Health, Welfare and Sport provides regulation and oversight on the competition of health markets and safeguards the standards of care for TB prevention and treatment. In addition, the central government through the RIVM participates in the policy-making of international organizations. The KNCV, which is a nongovernmental organization and an international centre of expertise for TB control, acts first of all as an advocate and knowledge centre in supporting all stakeholders in improving the performance of services. Its continuous international field practice effectively strengthens this role *(11)*.

The RIVM, responsible for infectious disease control, provides close policy support to the Ministry of Health, Welfare and Sport and plays a central role in maintaining high-level laboratory services and in managing the national surveillance in close cooperation with KNCV. With regard to partnership arrangements, the Committee on Practical Tuberculosis Control has the very important function of synchronizing policy proposals, especially those related to professional guidelines *(11)*.

The strength of the current governance approach is the well-functioning horizontal governance *(12)* processes, which refers to collaboration arrangements between stakeholders, such as professional associations, KNCV, RIVM and municipalities. These active and committed stakeholders constantly seek to develop the current organizational structure by forming long-term strategic visions for the various functions of the programme in strong coordination. In this light, it is not by chance that the Ministry of Health, Welfare and Sport asked RIVM and KNCV to jointly develop a National Tuberculosis Control Plan *(11)*, incorporating the former plans and recommendations of the KNCV.

Even with regard to some aspects of the vertical governance, the mission observed positive signs, especially since the Ministry of Health, Welfare and Sport approved the National Tuberculosis Control Plan with specific objectives and supported its update through the RIVM. This document functions as a valid reference point for all stakeholders in the programme. Nevertheless, the vertical dimension of governance clearly represents unquestionably the biggest challenge in some important aspects.

First, the vertical coordination by the Ministry of Health, Welfare and Sport does not effectively support the current service delivery and funding model of the current organizational structure. In theory, the responsibilities of the stakeholders in the organizational structure should be strictly aligned to their accountability and to their capability and authority to fulfil the expectations stemming from their defined responsibilities. TB control is rightly conceptualized as “intensive collaboration between clinical, laboratory and public health personal, at the local, regional and national levels, combined with vertical links between the levels” *(11)*.

In this light, although the Public Health Act states that the municipal executive is responsible for providing general infectious disease control within the municipality *(11)*, the GGDs, in fact,

seemingly fall short of proper authority and capability to hold accountable and influence other important stakeholders that are responsible for funding, regulation or clinical treatment. Since 2006, the Ministry of Health, Welfare and Sport has increased the number of stakeholders in the programme by delegating essential parts of its authority for regulation and for oversight to the quasi-independent government agencies. This systematic delegation of authority was not accompanied by a comprehensive mechanism for the vertical coordination that could ensure coherence among the important elements of the main policy cycle of the TB programme, such as monitoring, evaluation, planning and implementation. The key issue here is that there is ambiguity in practice on how to ensure alignment between responsibilities and accountability for effectively managing the main policy cycle of the programme.

As a consequence, the feedbacks are missing or seem to be unreasonably slow between the stages of the policy cycle, for example from the Ministry of Health, Welfare and Sport to other stakeholders in regulation matters. The Committee on Practical Tuberculosis Control recommended the reorganization of risk group screening of immigrants to the Ministry of Health, Welfare and Sport in September 2012, but the Ministry of Health, Welfare and Sport has not yet responded to this suggestion, which would have increased the efficiency of the programme.

Second, although there is a well-elaborated surveillance and monitoring system managed by RIVM, KNCV and GGDs in cooperation, there is no comprehensive performance assessment framework that would enable performance to be assessed for important aspects, such as sustainable funding and efficiency.

Recommendations

- Continue to compile and use strategic plans and action plans to ensure horizontal and vertical cooperation for all stakeholders.
- Set up a comprehensive performance assessment framework that would include measuring the efficiency of the programme. This framework could also synthesize the outputs from the monitoring activities of other main actors, including RIVM, KNCV and GGDs.
- Organize a platform or national committee for partnership to improve vertical collaboration in the form of transparent and regular consultation by involving all main stakeholders such as the Ministry of Health, Welfare and Sport, RIVM, Committee on Practical Tuberculosis Control, GGDs, KNCV and professional associations. The platform would help to speed up the feedback between the stages of the policy cycle and to improve the alignment between the functions of the programme, such as service delivery, stewardship, regulation, planning, monitoring and evaluation. This platform would assess the annual progress based on the comprehensive performance reports and would initiate actions for correction and/or for improvement. The KNCV as knowledge centre and the RIVM being the responsible actor for health system performance assessment and for managing surveillance could jointly prepare the performance assessment of the TB programme. The platform could discuss and approve action plans to implement the strategies and realize the visions for the TB programme, but the Ministry of Health, Welfare and Sport would have the right to veto issues of funding and regulation.

Developing human resources

Currently there is no formalized or systematic national human resources development plan for TB prevention, care and control including all sectors. This absence has to be seen in the context of a country in which the total number of (new) people with TB and also the (estimated) TB incidence and TB notification rates have gradually steadily declined during the past decade. (The total number of TB cases detected was less than 848 in 2013 *(13)*, confirmed during finalization of this report, compared with 958 in 2012 and more than 1300 in 2003; see also for more details under key findings.)

There is therefore a substantial risk of losing expertise in TB prevention, care and control among health personnel (identifying suspected cases, diagnosis, treatment and overall management of people with TB), particularly since this decline is expected to continue in the coming years.

The considerable heterogeneity of the TB burden from a geographical and risk-group viewpoint adds to the complexity of an overall declining TB burden in the country as a whole. Thus, comparing between people born outside the Netherlands (2012 TB notification rate of 40.3 per 100 000) and people born in the Netherlands (1.5 per 100 000) renders the need for a carefully tailored TB human resource strategy all the more important. Some areas, particularly rural ones, are more heavily populated by people born in the Netherlands, whereas the proportion of people born outside the Netherlands is generally higher in the more densely populated large cities, of which the four largest are situated in the western part of the country. More specifically speaking, the ratio of TB-relevant human resources per capita would have to vary considerably between more densely populated areas and more rural, less densely populated ones, and analogously the planning and training, or also sustainable development of TB human resources would require a different approach to ensure timely TB detection and effective treatment, including providing psychosocial support.

Taking into account the above-described downward trend in the TB burden and the heterogeneity and also taking into account a key recommendation of the National Tuberculosis Control Plan, TB public health physicians, nurses and medical technical assistants must all be able to perform a sufficient number of high-quality TB-relevant procedures related to the prevention, control and care of TB. These procedures are also partly defined in the National Tuberculosis Control Plan (individual professional caseload standards).

Overall, there is a two-pronged approach to TB in the Netherlands with regard to TB-relevant specialized human resources. In the public health sector, TB physicians, TB public health nurses and medical technical assistants provide TB control. They are mainly working in the GGDs distributed all over the country. In the hospital sector, pulmonologists and internists or infectious disease specialists deal with TB, diagnosing and treating people with TB (and by notifying the people with TB to GGDs, TB nurses provide treatment support); in the laboratories, medical microbiologists and analysts perform TB-relevant tasks.

Physicians involved in TB care

The physicians who deal with TB are mainly pulmonologists and public health physicians. In recent years, the number of posts for such doctors within the municipal health services has gradually declined; on 1 January 2010, 27.0 full-time equivalents remained (31 doctors) *(11)*. It is foreseen that, until 2015, nine TB doctors (6.4 full-time equivalents) will cease to practise due to retirement *(11)*. Because of the changing TB epidemiology in the country, the volume and

nature of TB physicians' activities have changed considerably throughout the recent decade, due to the declining incidence of TB, the increasing complexity of many cases (through HIV coinfection, use of immunosuppressants and MDR/XDR-TB), changes in screening policy (reduced frequency of radiological examinations, use of interferon-gamma release assays for detecting latent TB infection) and regionalization of services. Further, clinical familiarity with and expertise in TB is in danger of dwindling because of the declining incidence.

Sustainably ensuring maintaining sufficient TB knowledge and expertise requires greater concentration and focus of training and retraining. This would be reflected, for example, in the public health sector, by concentrating TB education and training in regional knowledge hubs (with teaching capacity and structures in place in the four or five main regions, with key trainers ensuring that newly trained physicians see a sufficient number of patients). In the hospital sector, where pulmonologists and infectious disease specialists in contrast to public health sector physicians also see non-TB cases, such as people with asthma and chronic obstructive pulmonary disease, TB control should be concentrated in the hands of hospital TB coordinators, who would be responsible for liaising with the GGDs and other sectors, and also guide other, less-experienced colleagues specializing in pulmonology or infectious diseases. The hospital physicians in larger hospitals may have a lower risk of losing skills related to TB, since the locations of the hospitals increase the probability of seeing more people with TB. Further, because of their broader skill mix of not only having people with TB and people suspected of having TB to deal with, general interest in TB is high, since it is an "interesting" disease to deal with.

Regarding public health TB physicians' future and given the dwindling TB burden, it would be helpful to provide appropriate career prospects and promote innovation within the discipline – that some TB doctors could gain an opportunity to move on to or additionally take up positions outside the GGDs. The future training of TB public health doctors should specifically address the changing profile of the discipline (such as the increasing importance of competencies in areas such as consultation, training and research). In the hospital sector, hospital TB coordinators should be appointed and clearly defined responsibilities assigned to them. This position should be formalized, and the task mix should entail training, capacity-building, liaising with GGDs and other relevant actors and developing and testing quality indicators.

Nurses involved in TB care

TB nurses carry out an important bridging function, connecting the various disciplines involved in caring for and supervising people with TB and conducting contact tracing *(11)*. They represent the main link between preventive and curative TB activities, also advising on infection control measures. In the hospital setting, this preventive function ties in with the activities of the hospital infection control experts. With falling numbers of people with TB, the number and task mix of TB nurses needs to be carefully monitored, ensuring sufficient TB knowledge and skill, keeping TB services both proficient and efficient. Since TB nurses acquire their expertise primarily in practical settings through gaining hands-on experience similar to public health physicians, their (initial) training should also be performed in regional centres, thus guaranteeing good exposure to a sufficient number of TB cases.

Medical technical assistants involved in TB control

Medical technical assistants are usually the first professionals to have contact with members of the public who call or visit with questions (vaccination, screening and contact tracing). Their communication and TB screening skills therefore require constant attention. Medical technical

assistants are usually practice assistants or have a comparable educational background. Regionalization of TB services means that they will much more often have to work in front offices without day-to-day daily direct physical backup from TB physicians and/or TB nurses. Their TB knowledge must therefore be adjusted, since their requirements may further increase in the future. Through reorganization as defined in a human resources plan for TB, the number of physicians and nurses working in the field of TB will eventually decline, and therefore the demands on technical assistants will increase, but also the degree of interest in their work in TB will eventually increase, which has to be coupled with more profound and adjusted TB training.

Given the physical distance between the public and the health authority's regional and back office, which will further increase in the future, particularly in rural areas with fewer TB cases, medical technical assistants' expertise and competence levels will become increasingly important. It is desirable that, in the regions, medical technical assistants develop their expertise and competencies further, emphasizing knowledge of protocols and procedures, communication skills, including transcultural communication and efficient knowledge transfer to people with TB and their family members.

Recommendations

- Develop a feasible, costed, SMART (specific, measurable, attainable, relevant and time-bound) human resources plan for TB that includes and consults all stakeholders covering a suggested five- to six-year period (2015–2020) in accordance with the overall health policy in place and the TB regionalization processes. The plan should be jointly developed by planning specialists from the Ministry of Health, Welfare and Sport, microbiologists from the national reference laboratory, GGDs and from all relevant professional associations, containing the following regional and peripheral laboratories' personnel, public health physicians, nurses and technical assistants, pulmonogists, infectious disease specialists and hospital managers (list not necessarily exhaustive).
- For the TB human resources plan, revisit and revise the terms of reference of all the stakeholders for which the plan is made (of associations and bodies and those mentioned above who should be involved developing it). It is recommended that TB public health personnel (physicians, nurses and technical assistants) should have possibly adjusted terms of reference in the future. This would mean to take account of dwindling numbers of people with TB in some areas (particularly rural areas in the eastern parts of the country), which could result in adding responsibilities that are not solely TB related or else consider reorganizing and reallocating human resources to spots with higher need (such as cities in the western parts of the country).
- Train TB public health regional physician and nurse coordinators (trained specifically for the field in which they work) and enable at least one TB nurse per region to develop further competencies in coordinating treatment and in academic research, possibly to the nurse-practitioner level. The tasks, responsibilities, training requirements and minimum TB caseloads should be clearly specified.
- Assess and evaluate yearly the patient numbers seen and cared for by all types of health personnel per region (both in hospitals, GGDs and laboratories, the latter for samples processed) on an annual basis and cater for flexible reorganization schemes, creating economically feasible enablers for personnel to relocate or retrain when deemed necessary by the regional health administration (it is important to maintain sufficient staff levels at

sufficient quality). This is to include the two existing TB specialized institutions of Dekkerswald and Beatrixoord.

- Consider mobile outreach units in very rural areas with very low numbers of people with TB, to compensate for the increasing distance of people with TB and people suspected of having TB, also with regard to contact investigation, to TB relevant health facilities, thus facilitating access to services and maintaining sufficient service efficiency.
- Clearly and formally link the pulmonologists in hospitals with their infectious disease specialist colleagues and the ambulatory GGD services, including strengthening joint case discussions and conferences.

Funding

Key findings

According to the data from the national health accounts, the Netherlands has very high total health expenditure and public expenditure on health in the WHO European Region, reaching 12% and 10.3% of gross domestic product in 2011, respectively. The national health accounts data also show that the general government expenditure for health within the state budget is also fairly high, at 20.6%, and has been increasing since the mid-2000s. At the same time, the share of out-of-pocket expenditure in comparison to the total expenditure on health remained fairly low and has even decreased since 2005.

Table 1. Selected ratio indicators for expenditure on health in the Netherlands, 1995–2012, selected years

Indicators	1995	2000	2005	2009	2010	2011	2012
Total expenditure on health as a % of GDP	8.3	8.0	10.9	11.9	12.1	11.9	12.4
General government expenditure on health as a % of total expenditure on health	71.0	63.1	64.7	79.6	79.6	79.5	79.8
Private expenditure on health as a % of total expenditure on health	29.0	36.9	28.1	13.1	12.9	13.4	13.4
General government expenditure on health as a % of general government expenditure	10.5	11.4	15.7	18.4	18.8	19.1	19.7
Social security funds as a % of general government expenditure on health	93.6	93.9	92.7	90.4	90.5	90.5	90.9
Private insurance as a % of private expenditure on health	49.3	43.0	56.2	37.9	37.2	38.7	39.0
Out-of-pocket expenditure as a % of private expenditure on health	33.3	24.3	26.8	40.9	41.3	41.4	41.7

Source: Global Health Expenditure Database [online database] *(14)*.

The focal point of the national TB programme reported to WHO that the total expenditure for TB was US$ 43 million in 2012, which indicates that total expenditure for TB control decreased by nearly US$ 9 million in comparison to 2011. However, this change can be explained partly by the large fluctuation in the exchange rate between the euro and the US dollar between 2011 and 2012. The expenditure for TB in 2011 was as low as 0.08% of the general government expenditure for health and 0.07% of the total expenditure on health.

The cost of TB control is fully funded from public resources apart from the compulsory deductible that the people with TB have to pay for using the services of basic health insurance to the insurance companies that cover the costs of services only after the copayment. In principle, this deductible should make citizens more aware of the costs of health care to prevent undesired moral hazard. It is, however, noticeable that health insurers may choose not to charge this deductible in specified conditions *(9)*. Uncertainty bands on how this amount – in case of economically disadvantaged patients who can be also compensated with a health care allowance for excessive costs *(9)* incentivizes the delayed use of services, which can increase the cost of the overall expenditure of the treatment and of TB control.

The municipalities receive money from the state budget for covering municipal health services and are responsible for covering the costs of source and contact tracing, of BCG vaccination, of treating uninsured people with TB, of screening immigrants and of general follow-up treatment, while GGDs contract with other government agencies for risk group screening *(11)*. The insurance companies pay the costs of diagnosis and treatment, including pharmaceuticals. The hospital services are paid through output-based payments using diagnosis treatment combinations, in a system inspired by the system of diagnosis-related groups from other countries. The hospital services for TB are classified among the services that are free for negotiation for price, volume and quality. Medical specialists within the hospitals can be salaried or contracted as independent professionals organized in partnerships. It was reported to the mission that the current payment mechanism for diagnostic services of the RIVM Reference Laboratory undermines adequate diagnosis and surveillance. This expenditure is now funded on the one hand from the shrinking budget appropriation distributed by the RIVM and on the other hand from unpredictable orders for services from other laboratories. At the same time, money is being used to build and maintain 33–40 highly specialized BSL III facilities providing more or less identical diagnostic services.

The main challenge in health funding is that there is no coherent and comprehensive institutional mechanism to follow up and monitor the financial data of the TB control programme. The data collection for funding seems to be fragmented and does not make it possible to analyse the allocation and efficiency of the financial resources in a standard and regular manner, which would be indispensable to make decisions on improving allocative efficiency. Since the Netherlands clearly has the appropriate technical, knowledge and financial capacity to develop a sound base for health accounts for health expenditure, including TB, and to apply cost-efficiency analysis, this important problem can be solved in the near future. The last comprehensive analysis of costs for TB control presented to the mission was carried out and published in an article in 2013 *(15)*. This article demonstrates well that the data collection for funding can be ensured in a comprehensive manner if appropriate organizational processes for doing this are put in place. Table 2 presents the findings for the resource allocation in 2009.

The authors indicated that they did not include some costs, such as those of general practice care, cost of screening for TB infection in hospitals (for patients before tumour necrosis factor-alpha-blocking activity therapy and health care workers), the medication costs of preventive treatment of the cost incurred by national organizations such as the Custodial Institutions Agency and the Central Agency for the Reception of Asylum Seekers. Other out-of-pocket costs, such as travel expenses for health care use and income during illness, were not calculated in this study. Without these items, the authors estimated that the total costs for TB and TB control might have been up to €30 million in 2009. Up to 61% of the resources were used for activities of the GGDs in 2009. Further careful analysis and evaluation is needed on how the current reorganization of GGDs

would increase the efficiency of the provided services for active detection of TB and latent TB infection cases and how the reorganization would allow shifting resources also for other emerging priorities.

Table 2. Allocation of financial resources for TB control, 2009[a]

Destination of financial resources	Cost in €	Cost in US $	Percentage
Departments of TB control of the CGDs	17 979 930	24 972 125	61
Hospitalization	7 481 434	10 390 881	25
National TB control (KNCV and RIVM)	2 432 000	3 377 778	8
Polyclinic diagnosis and follow-up by hospital specialists	719 948	999 928	2
Medication for standard TB treatment	528 644	734 228	2
Medication for treating M/XDR-TB	347 399	482 499	1
Total	29 489 355	40 957 438	100

[a] The ratio between euros and US$ is calculated using the average exchange rates for the year.

Source: de Vries & Baltussen *(15)*.

It was reported to the mission in one interview on hospital funding that the insurance companies seem to have insufficiently developed expertise with regard to purchasing TB services, since some tried to compare the prices of services for M/XDR-TB with the prices of services for uncomplicated TB to get a price reduction from the hospital in one case. According to the current reform plans for TB *(11)*, the treatment of people with M/XDR-TB would take place under the supervision of pulmonologists at one of the two TB centres in the future *(11)*, which would make any price negotiation on the treatment of people with M/XDR-TB meaningless.

Further, the free negotiation between the health insurer and provider on services for TB can theoretically lead to a situation in which no agreement is reached on providing services, which would endanger the provision of the hospital services for TB in the given area.

Recommendations

- Establish a comprehensive and coherent data collection and reporting mechanism for the funding and costs of TB control.
- Ensure that TB services by hospitals are classified in the A segment of the services in which the insurer can negotiate only volume and quality aspects while the Health Care Authority establishes the prices.
- Analyse carefully how the compulsory deductible influences the utilization of TB services. If there is evidence for delayed utilization, stop charging the deductible for people suspected of having TB and people diagnosed with TB.
- Create sustainable funding conditions with appropriate payment mechanisms for the laboratory functioning as the national TB reference laboratory to maintain the current high-level services to other laboratories and to initiate quality control programmes (see more in the section on laboratory).
- Perform detailed efficiency analysis for active detection of TB and latent TB infection cases along with the planning process for the new service delivery model of the GGDs.

TB among children

Key findings

The surveillance system in the Netherlands allows in-depth analysis, and there is commitment from both the policy and clinical levels to address childhood TB, shown by their participation in international task forces and research and clinical networks focusing on childhood TB. In 2013, KNCV analysed the current situation, achievements, challenges and missed opportunities in preventing and controlling childhood TB, and that study provided the numbers below.

Children in the Netherlands have a low level of TB, with a continuous decrease since the 1990s. In 2012, 50 cases of TB among children were notified, accounting for 5% of all TB cases and an incidence of 1.7 per 100 000 population. The low level of TB among children potentially signals low levels of recent transmission in the community as a whole, especially given no evidence of increasing trends in overall TB incidence.

The largest proportion and highest notification rate of childhood TB cases has been detected among those born outside the Netherlands (32 per 100 000 in 2011) and their children born in the Netherlands (4 per 100 000 in 2011). Notification rates are steadily and rather rapidly declining among children born in the Netherlands to parents born in the Netherlands (0.2 per 100 000 in 2011); the decrease in the notification rate is less pronounced among children born outside the Netherlands. Children born in the Netherlands to parents born outside the Netherlands comprise a special risk group in which there are indications of more pronounced recent transmission.

The caseload of diagnosing and treating children is divided between paediatricians (one third) and TB control units of the GGDs (two thirds). The large majority of children are detected through contact investigation (about 60%); the rest are detected through the migrant screening programme and occasionally also in other screening programmes.

Overall culture confirmation of childhood TB cases is very low compared with many other countries: only 29% of the children had their diagnosis confirmed by culture during 2005–2010. The justifications for this low level of culture confirmation were that there would not be a reason to doubt a clinical diagnosis if a child is a close contact of a TB case. This is reflected in the fact that, for passive case-finding, culture confirmation plays a more important role in diagnosis than active case-finding (about 60% versus 10% of the cases were confirmed by culture, respectively, during 2005–2010).

Few children are admitted to the hospital for a short stay (about 15%), often in relation to confirming the diagnosis, and the treatment is then managed in outpatient care. Children are hospitalized for longer stays only if they are seriously ill or have complications. The treatment completion is very good, with an overall successful completion rate of 94%. The highest level of unsuccessful treatment outcome was among the youngest children, who have slightly higher mortality because of serious forms of TB such as meningitis and disseminated disease.

About 100 children with latent TB infection are started on preventive treatment annually, with about 90% of the children who started preventive treatment for latent TB infection completing the full prescribed regimen. However, not all children with latent TB infection are started on preventive treatment (about 10%), and thus there is still some room for improvement in preventing additional cases. There are therefore some missed opportunities for detecting and

treating latent TB infection, especially among migrants (both those born outside the Netherlands in the Netherlands).

Source finding and contact investigation around childhood TB cases has not been done among as many as two thirds of the children during 2006–2010. For symptomatic children detected through passive case-finding, source finding and contact investigations are done for about 75% of the children, while for cases detected through active case-finding this was done for only about 15% of the children.

BCG vaccination is provided to children between six months and 12 years old who have at least one parent from a country with a high incidence of TB. The municipal health services budget currently funds this. In 2009, 13 908 BCG vaccinations were provided in the Netherlands *(11)*. Although BCG vaccination of high-risk groups has been implemented, not all eligible children are vaccinated. Of the children with TB who belong to a target group and are eligible for BCG vaccination, as many as 50% have not been BCG vaccinated. Especially for children with disseminated TB, more than 80% of those belonging to a target group of BCG had not been vaccinated.

In 2005, guidelines on tuberculin skin testing for diagnosing latent TB infection were changed. Previously, BCG-vaccinated children were not tested for latent TB infection. We were informed that there were issues with implementing these new guidelines. Since the new guidelines on tuberculin skin testing were adopted, however, the number of children born in the Netherlands to parents born outside the Netherlands who have latent TB infection has increased. In 2007, the interferon-gamma release assay was introduced, and the number of born in the Netherlands to parents born in the Netherlands with latent TB infection has decreased since then, but the number of children born in the Netherlands to parents born outside the Netherlands who have latent TB infection remains at a similar number of cases per year.

Recommendations

- Ensure implementation of BCG vaccination policy to increase coverage in risk groups *(16)*.
- Source finding and contact investigation must be ensured for all children with TB.
- Scale up the implementation of latent TB infection detection and provision of preventive treatment to eligible children, especially among migrants upon entry, and among children born in the Netherlands to parents born outside the Netherlands and children born outside the Netherlands upon contact tracing or where latent TB infection testing of the children is indicated.
- Child-friendly drug formulations should be made available.
- Ensure sustainable numbers of paediatricians with sufficient experience and exposure to childhood TB cases.

Screening and contact investigation

Specific objective: to review and advise on screening and contact investigation policies and practices, especially for migrants.

Screening

On 28 June 2013, the Committee on Practical Tuberculosis Control approved a document stating the policy for risk groups in the Netherlands. The report distinguishes the following risk groups:

- contacts of infectious people with TB;
- asylum-seekers and migrants from high endemic areas;[a]
- travellers to high endemic areas;[a]
- sailors visiting harbours outside western Europe and the Mediterranean;
- children <12 years of age with parents from high endemic areas;[a]
- people with work-related contacts with risk groups with an incidence of >50 per 100 000 population per year;
- employees of microbiological laboratories;
- people with work-related contacts with animals susceptible to TB;
- prisoners;
- alcohol and drug addicts and homeless people;
- illegal and uninsured people; and
- individuals with reduced immunity.

[a] Defined by WHO as incidence >50 per 100 000 inhabitants.

The country visit team was presented with the experience of screening of asylum-seekers, migrants and prisoners and was informed about contact investigation activities.

Asylum-seekers

The TB screening policy for asylum seekers includes mandatory screening by chest X-ray for active disease at entry *(17)*. In the two years thereafter, asylum-seekers >12 years of age and coming from countries with an estimated TB incidence of >200 per 100 000 population are offered four follow-up screenings. Participation in the follow-up screenings is voluntary. GGD Nederland organizes the screening as a contracted service.

Asylum-seekers that enter the Netherlands can be divided into groups. The largest group (about 95%) are those that come to the Netherlands by land. They stay at the Central Reception Location Ter Apel for the first days after entry. Those that enter via Schiphol Amsterdam Airport stay in the Detention Centre Schiphol the first days. Asylum-seekers who are invited to come to the Netherlands, the UNHCR (United Nations High Commissioner for Refugees) refugees, get housing in a community after arrival. Finally, there is the group of unaccompanied minor asylum-seekers. They stay in a process reception location for unaccompanied minors.

At the Central Reception Location Ter Apel, asylum-seekers can be screened seven days a week and chest X-ray images are read daily. At Detention Centre Schiphol, chest X-ray screening is available twice per week. UNHCR refugees are invited to come to a screening location.

Chest X-rays are performed for migrants of all ages. Those younger than six months of age are referred to a hospital that can perform X-rays on children. Children younger than 12 years are checked for a BCG scar. If they do not have a BCG scar, and if no documentation of BCG

vaccination is available, they are offered BCG vaccination if they have a negative tuberculin skin test.

Between 1992 and 2010, 169 400 asylum-seekers were screened. The number of asylum-seekers arriving in the Netherlands varies by year and varied from 5000 to 15 000 asylum seekers per year in the past decade. In 2012, 13 300 asylum-seekers arrived. The coverage of the screening of asylum-seekers on entry was 97.5% in 2011. Coverage of first follow-up screening was at least 53.4%.

Individuals with abnormalities detected using chest X-ray are examined for TB if requested by the reading doctor, either by a questionnaire and/or further by smear microscopy and culture depending on findings. If positive for TB, they are treated in the asylum-seeker centre until they are no longer infectious. Some are directly referred to Haren (Beatrixoord) for inpatient treatment. Individuals with abnormalities not related to TB that require health care are referred to a general practitioner.

Migrants

The screening policy for immigrants is the same as for asylum-seekers: mandatory screening by chest X-ray at entry and thereafter four voluntary follow-up screenings are offered *(17)*. The policy for screening children is also the same, including the policy and procedures regarding BCG vaccination.

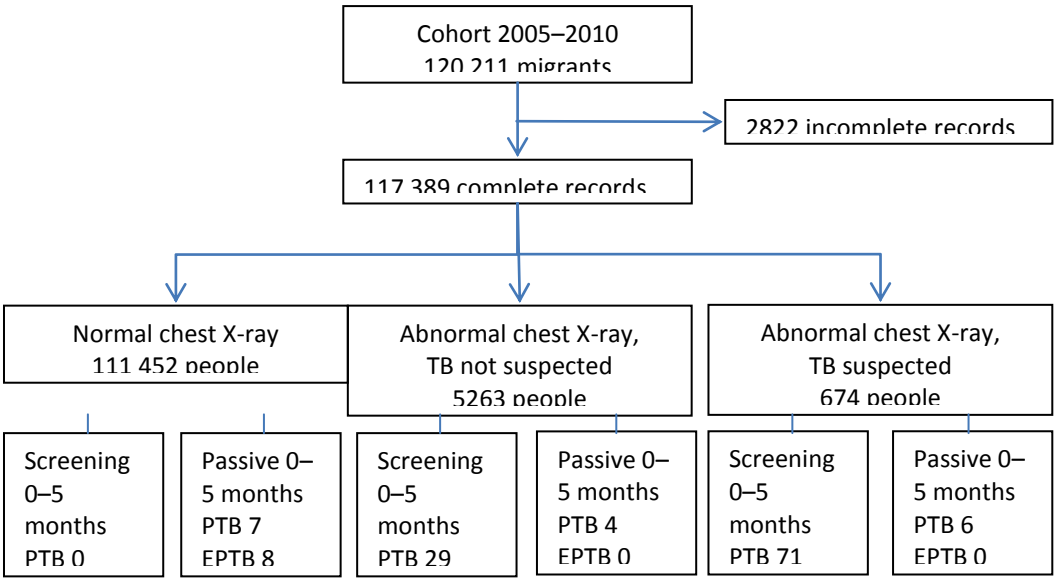
Immigrants who plan to stay for more than three months in the Netherlands need to be screened for TB to get a permit to stay. The Immigration and Naturalization Service informs immigrants to the Netherlands that they need to go to the municipal health service for screening within three months after arrival in the Netherlands. In practice, immigrants first get a permit and then need to be screened within three months. There seems to be no mechanism to check whether all immigrants to the Netherlands undergo the mandatory TB screening at entry.

An evaluation of the immigrant screening policy using data from immigrants arriving from 2005 to 2010 analysed results of 117 389 screened immigrants *(18)* (Fig. 2). Of those screened, 111 452 had a normal chest X-ray. In this group, with a normal chest X-ray, 16 people had TB (14 per 100 000 people). Of the 117 389 screened, 5263 had an abnormal chest X-ray but were not suspected of having TB; of those, 35 (665 per 100 000) were diagnosed with TB: 31 through screening and 4 through other methods. Of all those screened, 674 had an abnormal chest X-ray and were suspected of TB; in this group 82 (12 166 per 100 000) people were diagnosed with TB: 76 through screening and 6 through other methods.

The calculated coverage of entry screening averaged 45% over the years, comparing the number of migrants screened with the number of migrants registered as new entries by the Central Bureau of Statistics.

About 20 000 immigrants are screened per year. The coverage seemed to be declining between 2005 and 2010. It was suggested that this may be due to registration problems. In the screening cohort, about 80% of TB cases were identified through active case-finding and 20% through passive screening. It was very clear that the yield of screening is higher among immigrants from countries with a higher estimated TB incidence. The coverage of the first follow-up screening was 52% in 2005 and 42% in 2009. Calculating the coverage of the follow-up screening appeared to be difficult, since it is not known how many immigrants left the Netherlands in the two- year follow-up period.

Fig. 2. Results of the yield of entry screening and follow-up screening of migrants in the Netherlands



PTB: pulmonary TB; EPTB: extrapulmonary TB.

Source: van Rest et al. *(18).*

The chest X-ray screening was always offered free of charge to immigrants. Recently, two municipal health services started asking immigrants to pay for the screening chest X-ray.

A cost–effectiveness and modelling study performed in 2008 concluded that screening immigrants for TB has unfavourable cost–effectiveness results: the costs are between €40 000 and €80 000, which is the threshold of the Council for Public Health and Health Care for making screening acceptable.

Recently, the cost–effectiveness and modelling study has been extended to compare the cost–effectiveness of immigrant screening using the interferon-gamma release assay alone; tuberculin skin testing alone; tuberculin skin testing followed by the interferon-gamma release assay; or chest X-ray. The preliminary results show that chest X-ray alone is the most cost-effective but adds only 2.8 quality-adjusted life-years (QALYs). The interferon-gamma release assay alone is less cost-effective than chest X-ray screening, but the QALY gain is 10.2 with more than €1 million in costs. The costs per QALY of all methods were above the threshold for cost-effective health care interventions. In this analysis, it seemed that only chest X-ray screening of a high-risk group, one exceeding 300 TB cases per 100 000, is cost-effective.

The Netherlands has implemented a pilot study with the objective of testing the feasibility of screening immigrants for latent TB infection using the tuberculin skin testing or interferon-gamma release assay test. The study included immigrants younger than 35 years of age who were eligible for active TB screening. In total, 725 immigrants were tested for latent TB infection: 262 were tested with the interferon-gamma release assay test alone and, of those, 35 (13.4%) tested positive. A total of 463 were tested with tuberculin skin testing as the initial test and, of those, 206 (44%) showed a tuberculin skin testing result of >5 mm. Of those, 192 (93%) were tested with the interferon-gamma release assay test and 55 had a positive result (29%). In total, 90 had a positive interferon-gamma release assay test and, of those, 79 received a diagnosis

of latent TB infection. Preventive therapy was offered to 58 (73%) of the 79 with a diagnosis of latent TB infection. Thirty-seven of 58 (64%) accepted preventive therapy and 33 of 37 (89%) started preventive therapy. So far, two have withdrawn from treatment.

Prisoners

GGD Nederland organizes the screening of prisoners with chest X-ray for active TB within the framework of a contract with the Custodial Institutions Agency. Since 2011, the Netherlands has used a triage system assessing whether the prisoner has risk factors for TB (such as nationality other than the Netherlands, homeless, drug user or symptomatic). Only if risk factors are present is the prisoner offered a chest X-ray screening for active TB. The triage is performed within 24 hours after the start of the detention. The chest X-ray screening is performed within one week after the start of detention. About 50% of the detainees need chest X-ray screening after triage. Prisoners refusing chest X-ray screening need to stay in isolation. This happens very infrequently.

GGD Nederland uses mobile X-ray buses for screening prisoners. They have 3.3 mobile units available for this activity. The number of prisoners who need to be screened is decreasing.

The Netherlands distinguishes four different types of detention centres. There are prison services for prisoners younger than 23 years of age, special detention facilities for illegal immigrants, drug traffickers, foreign nationals with no access to the Netherlands, correctional institutions for juvenile offenders (12–23 years old) and forensic care for prisoners with mental disorders. On any given day about 15 000 people are detained in one of these centres, and this adds up to 46 000 yearly.

Between 1994 and 2011, 504 675 prisoners were screened and 390 TB cases were identified: 77 TB cases per 100 000 prisoners.

Currently, prison services cannot exchange data with the municipal public health services because of personal data protection. Because of this, the effect of introducing the triage system cannot be evaluated nor whether the triage system can be improved. Another challenge is the fact that illegal immigrants may stay very briefly in detention. When the results of the screening are available, an illegal immigrant is already released and no longer reachable.

The municipal public health services are involved in treating prisoners with TB. The average treatment success rate among prisoners is 50–60%.

Recommendations

- Consider initial screening for latent TB infection, applying appropriate diagnostic tools for asylum-seeker and migrant children 0–11 years old.
- Discuss the implementation of latent TB infection screening for high-risk groups in the light of TB elimination even though latent TB infection screening is not cost-effective using the ceiling for cost–effectiveness of health care interventions.
- Evaluate the effect and cost–effectiveness of the change in the screening policy for prisoners.
- Evaluate the coverage of entry screening for migrants and assess whether permits should be linked again to proof of TB screening.

- Consider engaging general practitioners in following up TB screening among migrants.
- Adopt a consistent nationwide approach to TB screening with regard to costs for migrants.
- Ensure the implementation of TB screening, including systematic follow-up screening for migrants and other high-risk groups (finding the best way to ensure high participation).

Contact investigation

Key findings

The Netherlands has extensive experience with implementing contact investigation and evaluating large contact investigations. The national guidelines for contact investigation are currently under revision. The current contact investigation guidelines from 2007 *(19,20)* have not been not universally implemented. For example, contacts in ring 1 (close contacts) and ring 2 (regular contacts) are examined at the same time, whereas the guidelines recommend to first screen ring 1 contacts and to only screen ring 2 contacts if more latent TB infection or TB cases are identified than expected in ring 1 contacts.

Both contact investigation and screening of immigrants are performed at GGD departments. The TB doctors read the chest X-rays. The general impression was that the TB personnel at GGDs are dedicated and experienced personnel in different categories. The premises visited were well equipped, with infection control measures in place.

The municipal public health service in Arnhem described the procedures used for contact investigation. Contact investigation is initiated for all bacteriologically positive people with pulmonary TB. It is organized using the “stone in the pond” principle. Ring 1, 2 and 3 contacts are defined depending on the closeness of contact and duration of contact. If the number of latent TB infection and TB cases in ring 1 is not higher than expected, no investigations of ring 2 and 3 contacts are initiated. The TB nurses and doctors of the municipal health service decide whether the number of cases is higher than expected.

A contact investigation is divided into two rounds: one immediately following identification of the bacteriologically positive TB case and a second round two months after the last contact or after the infectious period of the index case is over. In the first round, ring 1 (household) contacts are investigated with the tuberculin skin test and chest X-ray. In the second round, only the tuberculin skin test is used. Those with a positive tuberculin skin test get an interferon-gamma release assay. BCG-vaccinated close contacts get a chest X-ray in the first round and a tuberculin skin testing in the second round.

The TB nurses of the municipal public health service organize contact investigations. They make all the arrangements necessary to implement the contact investigation. The nurses of the GGD in Arnhem explained that, at the start of the contact investigation, the TB nurse informs everyone involved in a meeting. The TB nurse uses several different tools, such as slide presentations, papers with frequently asked questions etc. The specifics of the organization of the contact investigation are decided on during the weekly meeting between the TB nurses and TB doctor(s) at the municipal public health service. In principle, contacts are invited to come to the municipal public health service for the tuberculin skin test, and contacts testing positive are examined at the GGDs or referred to the hospital for chest X-ray.

The management of contacts identified with latent TB infection differs. People diagnosed with latent TB infection that is believed to be caused by recent infection are offered three months of rifampicin and isoniazid preventive treatment. If there is reason to believe that the person will not adhere to preventive treatment, chest X-ray follow-up is offered. The option of preventive treatment is discussed with the person. For infected contacts of people with MDR-TB, chest X-ray follow-up is offered. In some municipal public health services, contacts of people with MDR-TB may be offered treatment with moxifloxacin after thorough discussion in a group of experts.

TB doctors at the GGD prescribe preventive treatment. They also follow up with chest X-ray. Adherence to preventive treatment is supported by follow-up visits to the TB doctor of the public municipal health service after one and two months. The TB nurse also calls people with TB after two weeks to ask how the preventive treatment is going.

The public municipal health service continually monitors contact investigations, and at the end there is an evaluation.

The Netherlands has a surveillance system that includes information on individuals with latent TB infection eligible for treatment and the outcome (completed or not) of latent TB infection treatment. Data from 2006 to 2010 showed that a mean of 23 contacts and a median of 7 contacts are investigated per TB contact investigation. Of the investigated contacts, 0.4% are diagnosed with TB and 6.8% identified with latent TB infection. The surveillance system showed that completion of treatment for latent TB infection is acceptable and increasing. The coverage of migrant contacts in contact investigations was significantly lower than the coverage of contacts born in the Netherlands.

The current Netherlands guideline for contact investigation has no system for identifying vulnerable contacts in rings 2 and 3, which should be included in ring 1 due to a higher risk of getting infected and/or developing disease after infection.

Following the National Tuberculosis Control Plan, TB control will be centralized to TB centres (regional TB expertise centres) in four to five regions. This might affect the adherence to TB investigations, screening and latent TB infection treatment, since the travelling distances will be long for some. The north-east regions (the five northern provinces of the Netherlands) will cover a particularly large area.

Recommendations

- Develop an implementation plan for the new contact investigation guidelines and monitor implementation.
- Secure optimal contact tracing, including in the migrant population.
- Establish a mobile screening clinic for screening contacts who live far from the nearest health care facility with a TB department.
- Use innovative IT solutions to support adherence to latent TB infection treatment, especially if the distance to the health facility is considerable.

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Annex 1

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Ineke Huitema, Human Resource Specialist

Beatrijs Stikker, Senior Adviser, Public Affairs and Executive Secretary

Health Care Inspectorate

Robbin Westerhof, Senior Inspector

GGD Nederland (Association of Municipal Public Health Services)

Ton van Dijk, Director, GGD Den Haag and responsible for the TB portfolio within GGD Nederland

Sjaak de Gouw, Director, GGD Midden-Holland, Leiden and responsible for the infectious diseases portfolio at GGD Nederland

Jelle Doosje, Senior Consultant

Quita Waldhober, Policy Adviser

Committee on Practical Tuberculosis Control

Maurits Verhagen, TB Doctor, GGD Limburg-Noord (Venlo); Chair, Committee on Practical Tuberculosis Control and Member of the Board of Trustees of the KNCV Tuberculosis Foundation

Other

Jan van Burg, Unit Uitvoeringsprocessen, Central Agency for the Reception of Asylum Seekers

Kim van Rooy, Custodial Institutions Agency

Jan Hendrik Richardus, Professor, Department of Public Health, Erasmus University, Rotterdam

Willemijn Schäfer, Netherlands Institute for Health Services Research, Utrecht

Mariet Top, Location Manager, Central Reception Location Ter Apel

Joep Abbing, Senior Support Employee, Central Reception Location Ter Apel

GGDs (municipal public health services)

Pauline van Schie, Head, of the Department of TB Control, GGD Den Haag

Erik Huisman, TB Doctor, Department of TB Control, GGD Den Haag and Secretary, Society of Tuberculosis Public Health Physicians

Margreet Kamphorst, TB Doctor, Department of TB Control, GGD Rotterdam-Rijnmond & Midden-Holland and Chair, Working Group on Screening Policies, Committee on Practical Tuberculosis Control

Wim Stoop, TB Doctor, Department of TB Control, GGD Arnhem (and the team of TB nurses)

Marco ter Harmsel, Acting Director, GGD Groningen

Tita Klimp, Head, Department of TB Control, GGD Groningen

Yvonne Aartsma-de Jong, TB Team Coordinator and Medical Technical Assistant, Department of TB Control, GGD Groningen and GGD Drenthe.

Rob van Hest, TB Doctor, Department of TB Control, GGD Rotterdam-Rijnmond and GGD Groningen.

Marinus Vermue, Public Health Nurse, Department of TB Control, GGD Groningen

Hospitals

Tjip van der Werf, Physician, Pulmonary Diseases and Tuberculosis and Professor, Infectious Diseases, University of Groningen, University Medical Center Groningen

Onno Akkerman, Chest Physician, TB Center Beatrixoord, University Medical Center Groningen

Jan-Willem Alffenaar, Hospital Pharmacist, University Medical Center Groningen

Tineke Berends, TB Nurse, Inpatient care, TB Center Beatrixoord, Haren

Liesbeth Schölvinck, Pediatrician, University Medical Center Groningen

Marjo van der Ven, Chest Physician and Clinical TB Coordinator, Rijnstate Hospital Arnhem

Clemens Richter, Internal Medicine and Infectious Disease Specialist, Rijnstate Hospital Arnhem.

Martin Boeree, Chest Physician, Associate Professor of Clinical Tuberculosis, Radboud University Nijmegen TB Centre Dekkerswald, Nijmegen

Cecile Magis, Chest Physician, Radboud University Nijmegen TB Centre Dekkerswald, Nijmegen

Inge de Guchteneire, Nurse Practitioner, TB Centre Dekkerswald, Nijmegen

Laboratories

Ed Kuijper, Professor, Medical Microbiology, Head, Department of Experimental Microbiology, Leiden University Medical Center and Chair, Medical Microbiology Working Group to Review the TB Diagnosis Guidelines

Jerome Lo Ten Foe, Medical Microbiologist, University Medical Center Groningen

Greetje Kampinga, Medical Microbiologist, University Medical Center Groningen

John Rossen, Molecular Microbiologist, University Medical Center Groningen

Nico Meesen, Medical Microbiologist and Medical Director, University Medical Center Groningen

Ron Bosboom, Medical Microbiologist, Streeklaboratorium Velp

Alwyn Ott, Medical Microbiologist/Epidemiologist, Laboratorium voor Infectieziekten, Groningen

On behalf of professional societies

Marleen Bakker, Chest Physician, Erasmus Medical Center, Rotterdam and organizer of the training programme (Master Class on Tuberculosis) for hospital TB coordinators and member, Working Group on Tuberculosis, Netherlands Society of Pulmonologists

Joke van Loenhout, TB Doctor, Department of TB Control, GGD Nijmegen and Chair, Working Group on Tuberculosis, Netherlands Society of Pulmonologists

Bert Mulder, medical microbiologist in Enschede and member, TB Section, Netherlands Society of Medical Microbiologists

Toos Waegemaekers, Infectious Disease Public Health Specialist, GGD Arnhem, Regional Infectious Disease Coordinator, National Institute for Public Health and the Environment, Centre for Infectious Disease Control and Chair, Public Health Section on Infectious Disease Control, Society of Infectious Disease

Erik Huisman, TB Doctor, Department of TB Control, GGD Den Haag and Secretary, Society of Tuberculosis Public Health Physicians

Sytze Keizer, TB Doctor, Department of TB Control, GGD Amsterdam and member, Society of Tuberculosis Public Health Physicians

Rob Broeder, TB Public Health Nurse, GGD Kennemerland and Secretary, Society of Tuberculosis Public Health Nurses

Alies de With, TB Public Health Nurse, GGD Flevoland and member, Society of Tuberculosis Public Health Nurses

Yvonne Irving, Medical Technical Assistant, GGD Doetinchem and Chair, Society of Medical Technical Assistants

Marie Louise van Donzel, member, Society of Medical Technical Assistants

Annex 2

PROGRAMME

Time	Venue		Topics and activities	Other invited guests
Monday, 30 September (day 1) (Coordinators: Rob Riesmeijer and Gerard de Vries)				
13:30–17:00	Ministry of Health (VWS), The Hague	13:30	Marianne Donker (VWS): Welcome and introduction	Ellen de Boer (VWS), Philip van Dalen (VWS), Kitty van Weezenbeek (KNCV), Connie Erkens (KNCV), Maurits Verhagen (CPT), Dick van Soolingen (RIVM)
		13:40	Introduction team and terms of reference	
		14:00	Overview current state of TB control in the Netherlands (according to the National TB Control Plan/ECDC/MAP indicators) – Gerard de Vries (RIVM/KNCV)	
		14:30	Inventory by the Health Care Inspectorate (IGZ) on the situation of laboratory TB services in the Netherlands - Robbin Westerhof (IGZ)	
		15:20	Organizational developments and dilemmas in the TB public health services – Ton van Dijk and Jelle Doosje (GGD Nederland)	
		15:50	Screening asylum-seekers – Jan van Burg (COA) and Quita Waldhober (GGD Nederland)	
		16:20	Results of the pilot to screen migrants for LTBI – Susan van den Hof (KNCV)	
Tuesday, 1 October (day 2), Team 1 (Coordinators: Niesje Jansen and Gerard de Vries)				
09:00–10:00	The Hague (VWS)	09:00	Screening immigrants – Niesje Jansen and Job van Rest (KNCV) Screening prisoners – Kim van Rooy (DJI) and Jelle Doosje (GGD Nederland) Cost–effectiveness of TB screening interventions – Jan Hendrik Richardus (Erasmus MC)	Ellen de Boer (VWS), Philip van Dalen (VWS), Margreet Kamphorst (MSR working group), Jelle Doosje (GGD Nederland)
10:00–10:45	The Hague (VWS)		Discussion on screening policies and practices	Ellen de Boer (VWS), Philip van Dalen (VWS), Margreet Kamphorst (MSR working group), Rob Riesmeijer (RIVM-CIb)
11:15–12:30	The Hague (VWS)		Financing TB control in the Netherlands – Marieke Mossink (VWS) Cross-border TB control issues – Niesje Jansen (KNCV) Discussion on access to TB services	Ellen de Boer (VWS), Philip van Dalen (VWS), Jelle Doosje (GGD Nederland), Rob Riesmeijer (RIVM-CIb)
13:30–15:00	GGD Den Haag	13:30	Public health office (Pauline van Schie, Erik Huisman) - Function and role of TB public health office (site visit) - Big city TB control aspects (workload; forced isolation; continuity of care of TB in prisoners)	
16:00–17:00	LUMC		Laboratory services and TB diagnostic guidelines – Ed Kuijper	
13:30–17:00	KNCV		Governance and financing (Szalbocs Szigeti) - 14:00 KNCV role in TB control (De Vries and Van Weezenbeek) - 15:00 Public health law (George Haringhuizen) - 16:00 NGO role in TB control and advocacy (Stikkers, TBC)	

Time	Venue		Topics and activities	Other invited guests
Tuesday, 1 October (day 2), Team 2 (Coordinator: Connie Erkens)				
08:34–11:14	The Hague – Groningen (train)		Discussion with Connie Erkens on Committee on Practical TB Control (CPT) and other TB control issues	
12:00–15:15	TB Centre Beatrixoord		Lunch presentations and discussions on clinical, microbiological and pharmaceutical issues in TB control (Tjip van der Werf, Onno Akkerman, Jan-Willem Alffenaar, Tineke Berends, Jerome Lo Ten Foe, Greetje Kampinga, John Rossen) - Special attention to MDR-TB, coinfections and infection control Site visit, TB Centre Beatrixoord (Sanatorium)	
16:00–17:30	UMCG		Site visits - Laboratory (Lo Ten Foe and Kampinga/Rossen) – Lillebaek - Childhood TB (Schölvinck and Erkens) – Sandgren - SAAM-poli (LTBI) (Van der Werf) and Pharmacy (Alffenaar) – Dara and Ronning	Nico Meesen (directeur medische zaken en arts microbioloog)
Wednesday, 2 October (day 3), Team 1 (Coordinator: Gerard de Vries)				
10:15–12:00	GGD Arnhem	10:15	Discussion GGD and site visit (Wim Stoop) - Site visit (+ BCG vaccination) - Contact investigation + DNA fingerprinting - Patient support and guidance (DOT) - Collaboration with hospital/laboratory	
12:30–13:30	Rijnstate Hospital (Arnhem)		Lunch meeting with patient discussion	
12:30–13:30	Rijnstate Hospital (Arnhem)		Financing tertiary care (Boeree) – Szigeti	
14:00–15:30	Arnhem (Rijnstate)		Discussion on clinical and organizational issues in inpatient TB control (Marjo van der Ven, Clemens Richter, Cecile Magis, Inge de Guchteneire) - Hospital TB coordinator - HIV - Ambulatory MDR treatment and care (Inge de Guchteneire) Visit to hospital ward – to be confirmed	
14:00–15:30	Velp (laboratory)		Site visits and discussion at laboratory (Ron Bosboom) – Gonzalo	
Hotel	Utrecht (teams 1 and2)			
Wednesday, 2 October (day 3), Team 2 (Coordinator: Connie Erkens)				
09:30–11:30	Asylum-seeker centre Ter Apel	09:30	Screening, infection control and legal issues – Tita Klimp	
12:30–15:00	GGD Groningen		Lunch presentation, GGD Groningen - Function and role of TB public health office (+ site visit) (Rob van Hest) - TB screening and prevention among asylum-seekers (Aartsma) - The role of the nurse-practitioner (Marinus Vermue)	
12:30–15:00	To be arranged		Troels Lillebaek to visit LVI Groningen (Allewyn Ott)	

Time	Venue		Topics and activities	Other invited guests
Thursday, 3 October (day 4) (Coordinators: Gerard de Vries and Rob Riesmeijer)				
09:00–10:30	RIVM	09:00	RIVM activities (chair: Hans Lobach) Tuberculosis reference laboratory (including genotyping) – Dick van Soolingen, Rianne van Hunen EPI: Surveillance – Wim van der Hoek, Erika Slump LCI TB control activities – Sophie Toumanian	Heads of departments, other involved RIVM staff, Niesje Jansen, Connie Erkens, Rianne van Hunen (KNCV)
10:45–12:30	RIVM		Site visits and individual discussions - TB reference laboratory (Van Soolingen, Rianne van Hunen) – Lillebaek/Gonzalo - Surveillance (Erika Slump, Job van Rest, Henrieke Schimmel, Erkens) – Van der Werf and Ronning	
		10:45	- Access to diagnostics and drugs (Van der Zwan and De Vries) – Szigeti and Dara	2 times 3 sessions for about 30 minutes (Van der Boom and Sandgren to be assigned to one of the groups)
		11:20	- Quality control and review programme of TB public health offices (Toumanian and Jansen) – Szigeti and Dara	
		12:00	- Collaborative issues with other infectious diseases (Hans van der Kerkhof and De Vries) – Szigeti and Dara	
13:30–16:30	Utrecht	13:30	Annette de Boer, chair Round-table discussion with professional associations (with break) Invited professional organizations: - NVALT (pulmonologists) - NVMM (microbiologists) - VvAwT (TB public health doctors) - VIZ-SIB (infectious disease public health doctors) - VandVN/Cie Tuberculose (TB public health nurses) - MTMBeVe (medical technical assistants) - Organizations involved in education (KNCV, GGD Nederland)	CPT
16:00–17:00	Utrecht (NIVEL)		The role and function of the first line (GPs) in the health system in the Netherlands (Willemijn Schäfer, NIVEL) – Szabolcs Szigeti	
Friday, 4 October (day 5) – plenary CPT (Coordinator: Connie Erkens)				
11:30–15:00	Former TB Centre Zonnestraal (Hilversum)		Plenary CPT (only TB public health doctors and nurses)	
Friday, 4 October (day 5) – feedback session (Coordinators: Gerard de Vries and Rob Riesmijer)				
09:00–14:00			For team to write recommendations	
15:30–17:00	Former TB Centre Zonnestraal		Feedback and recommendations of the review team. Time for response: - Ministry of Health (VWS): Marianne Donker (Director, Public Health) - Association of Netherlands Municipalities (VNG): Jantine Kriens (TBC) - GGD Nederland: Sjaak de Gouw, Director, GGD Midden-Holland and Portfolio Infectious Diseases, GGD Nederland - RIVM/CIb: Aura Timen, Head, National Coordination of Infectious Diseases Control Department - KNCV: Kitty van Weezenbeek, Executive Director	

Annex 3

STATUS OF IMPLEMENTATION OF THE MAIN RECOMMENDATIONS OF THE PREVIOUS TB PROGRAMME REVIEW IN THE NETHERLANDS IN 2008

Recommendation	Responsible	Status	Document
Chapter 1. Organization			
a) The Centre for Infectious Disease Control/RIVM and KNCV need to develop a more functional and coordinated relationship that capitalizes on the considerable strengths of both organizations. This will require a more clear definition of roles and responsibilities and better mechanisms for communication and coordination.	Centre for Infectious Disease Control/RIVM and KNCV	Completed	Letter from the directors of the Centre for Infectious Disease Control and KNCV
b) The process of centralizing TB management in 30 front and 7–8 back offices in GGDs should continue, to ensure TB competence at the regional levels and proper management at the local levels. There are some concerns regarding the managerial and financial aspects – and surveillance.	GGDs	Scaling up regions to four regional offices is proposed	
c) KNCV is advised to seek closer contact with the Dutch Working Party on Antibiotic Policy, the Dutch Working Party on Infection Prevention and the National Coordination Centre for Communicable Diseases, including for guideline development.	Committee on Practical Tuberculosis Control	Partly done (with the National Coordination Centre for Communicable Diseases and the Dutch Working Party on Infection Prevention)	
d) The Health Council of the Netherlands could be used actively to bring forward important issues to the Ministry of Health, Welfare and Sport	Committee on Practical Tuberculosis Control	Not done in the past 5 years	
Chapter 2. Performance and organizational aspects of diagnosis and treatment in hospitals and GGDs			
a) The focus of TB training should be broadened to include infectious disease specialists and general physicians, as well as, perhaps, other categories of providers.	KNCV and the Dutch Society of Physicians for Respiratory Diseases and Tuberculosis	TB is part of public health infectious disease training	
b) Strong ties should be developed and maintained between the programme (KNCV) and local and national professional societies (especially pulmonology and infectious diseases) and academic institutions to foster continued TB training in residency, fellowship and continuing education programmes.	KNCV	Pulmonologists have two TB training sessions: basic (4 days) and TB coordinator (2 days)	

Recommendation		Responsible	Status	Document
c)	Connections also need to be developed and strengthened between the programme and groups such as the hospital infection control and antimicrobial use and control groups.	GGDs	Partly done at the local or regional level	
d)	The role of “non-programme” physicians should be examined and quantified.		Not done	
e)	A study of diagnostic delays should be performed to determine whether there are systematic impediments to the prompt recognition of a person suspected of having TB and collection and submission of diagnostic specimens.		Done for spinal TB	IJdema DJ, Magis-Escurra C, Horsting PP, Erkens C, Aarnoutse R, Boeree MJ. Clinical characteristics and diagnostic delay in spinal tuberculosis patients in the Netherlands. Submitted.
f)	There should be an analysis of the high proportion of non-confirmed cases to determine whether the high proportion is a result of failure to submit specimens, overdiagnosis, poor laboratory performance or other causes.		Done	Magis-Escurra C, Erkens C, Peters B, Schamp R, Dekhuijzen PNR, Boeree MJ, et al. Characteristics and accuracy of non-culture confirmed tuberculosis diagnosis in The Netherlands from 2007-2009. Submitted.
g)	Working with HIV care providers, guidelines should be developed for TB screening (both latent TB infection and active TB) among people living with HIV and HIV testing among people with TB.	Committee on Practical Tuberculosis Control	Done	Revised TB-HIV guidelines (http://www.kncvtbc.nl/sites/publickncv.antenna.nl/files/regelgeving/25.330.pdf)
Chapter 3.	**Active case-finding and outbreak management**			
a)	The use of either tuberculin skin tests or interferon-gamma release assays to screen risk groups should be increased. This is particularly relevant to groups that will be relatively stable. Screening with chest radiography should be continued in mobile high-risk groups.	Committee on Practical Tuberculosis Control	Done, for example, in contact investigation	Guidelines on risk group policy were revised (http://www.kncvtbc.nl/sites/publickncv.antenna.nl/files/regelgeving/25.320.pdf)
b)	In adults, the history of having had BCG immunization should be ignored in seeking to identify latent TB infection, especially if interferon-gamma release assays are available.	Committee on Practical Tuberculosis Control	Done	Guidelines on use of interferon-gamma release assay (http://www.kncvtbc.nl/ sites/public kncv.antenna.nl/files/regelgeving/25.101.pdf)
c)	Treatment for latent TB infection should be increased in groups at high risk.	Committee on Practical Tuberculosis Control, GGDs	Partly done, such as pilot screening of migrants for latent TB infection	
d)	The reason(s) for the low percentage of ring 1 contacts with latent TB infection should be examined.		Results of contact investigation 2006–2010 pending	
e)	There should be an increased focus on contact investigation, with the development and dissemination of policies, procedures, and standards.		Done: revision of contact invest-igation guidelines in progress	Mulder C, Erkens CGM, Kouw PM, Huisman EM, Meijer-Veldman W, Borgdorff MW et al. Missed

Recommendation	Responsible	Status	Document
			opportunities in tuberculosis control in the Netherlands due to prioritization of contact investigations. Eur J Public Health 2012;22:177–82.
f) The completeness and timeliness of contact investigations should be documented.		Partly done	Mulder C, Erkens CGM, Kouw PM, Huisman EM, Meijer-Veldman W, Borgdorff MW et al. Missed opportunities in tuberculosis control in the Netherlands due to prioritization of contact investigations. Eur J Public Health 2012;22:177–82.
Chapter 4. Laboratory services			
a) The number of laboratories performing TB diagnostic tests should be reduced or, if not possible, all techniques performed have to be quality controlled.		Done (inventory by the Health Care Inspectorate)	
b) The laboratory in Bilthoven should get official status as the national reference laboratory for mycobacteria in the Netherlands and must be involved in establishing a laboratory network for the whole country.		Not done	
In addition, the national reference laboratory should chair a working group for preparing official guidelines for safety and for all techniques used in detecting mycobacteria, which have to be followed in the other laboratories.		Done	
They should establish an external quality programme and offer training programmes for routine diagnostics.		Done	
To improve understanding of the function of a national reference laboratory, Bilthoven should organize a meeting for everyone involved in performing diagnostic microbiology for TB to explain the role of a national reference laboratory.		Done	
Having official status as a national reference laboratory will be helpful for international collaboration and for the function as a supranational reference laboratory of WHO.		National reference laboratory stopped as supranational reference laboratory	
c) All laboratories performing only microscopy and nucleic acid testing should have a BSL II laboratory, but all laboratories performing drug susceptibility testing must have a BSL III laboratory as internationally recommended.	Health Care Inspectorate	The Health Care Inspectorate will report their inventory	

Recommendation		Responsible	Status	Document
d)	A committee, chaired by the national reference laboratory, should prepare guidelines that must be followed strictly by all laboratories.	Dutch Society for Medical Microbiology	Guidelines are under revision	
e)	All laboratories should participate in an internal and external quality control programme on a regular basis. This programme should be established and led by the national reference laboratory.		Health Care Inspectorate will report their inventory; the quality control programme is not led by the national reference laboratory	
f)	All laboratories should be informed that the national reference laboratory offers training for all personnel involved in mycobacterial diagnostics, not only for new methods used in research.	National reference laboratory	Done	
g)	The laboratory reporting system should be standardized. Written guidelines may help introduction into all laboratories.		Laboratory results from RIVM are reported to GGD through Osiris-NTR	
Chapter 5.	**Surveillance, monitoring and evaluation**			
a)	The Centre for Infectious Disease Control and KNCV should clarify their roles, tasks and objectives regarding TB surveillance, monitoring and evaluation. Their respective mandates should be taken into account as well as the high level of development and expertise achieved on TB surveillance and control if any reorganization is planned.	Centre for Infectious Disease Control/RIVM and KNCV	Done: surveillance is now at the Centre for Infectious Disease Control/RIVM	
b)	Back offices should develop routine reports on the TB situation and progress in TB control in their correspondent region to guide public health actions. Ideally, standard reports should enable comparisons among regions.	Back offices of GGDs	Standard data were agreed on and annual reporting done by ~50% of back offices	
c)	Additional training should be provided to TB specialists – especially those in back offices – on epidemiological methods and data analysis as well as on the potential uses of the electronic systems currently available, such as downloading data from OSIRIS.	KNCV	OSIRIS training is provided	
d)	OSIRIS outputs should be developed for routine use at regional and local levels, such as predefined reports on variables distributed by region.	KNCV/Centre for Infectious Disease Control	Done: output at the regional level is provided annually	
e)	The various electronic systems in use should be coordinated to reduce duplicate work. For instance, a link from TUBIS to OSIRIS will enable automatic reporting of cases.	GGDs	No link between Tubis/OSIRIS (low priority, also because of costs)	

	Recommendation	Responsible	Status	Document
f)	To improve data quality, a new evaluation of the surveillance system and the Netherlands Tuberculosis Registry is proposed (determine the coverage of the system, sensitivity and specificity, timeliness of reporting, completeness of reported data, etc.). The last capture–recapture analysis was done in 1998.	Centre for Infectious Disease Control/RIVM – Committee on Practical Tuberculosis Control	Planned this year	
g)	KNCV and the GGDs should develop a standardized form to be used to provide aggregated data of findings by contact tracing.	KNCV	Source and contact investigation modules in TUBIS and OSIRIS-Netherlands Tuberculosis Registry were revised	

Annex 4

STATUS OF IMPLEMENTATION OF THE NATIONAL TB CONTROL PLAN 2011–2015

Objectives	Responsible	Status	Document
Chapter 4. Organization of TB control			
4.1. Structure			
4.1.1. National direction			
By 2013, TB control is to be subject to efficient and effective national direction, tailored to the structures and responsibilities for infectious disease control.	Centre for Infectious Disease Control/RIVM	Done	Letter from the directors of the Centre for Infectious Disease Control and KNCV
4.1.2. Public health care			
Until at least 2015, there is to be a nationwide network for TB control in the public health sector: the municipalities will be responsible and the municipal health services will organize it.	GGDs	Ongoing	
It is recommended that, by 2013, public TB control be organized based on four to five regions.	GGDs	Not yet achieved	
By 2013, each region is to have a regional TB control expertise centre (or similar institution) for TB control in the public health sector.	GGDs	Not yet achieved	
By 2015, there is to be central coordination and control of resources, such as information and communication technologies and mobile X-ray units.	GGDs	Ongoing	
By 2015, there is to be an adequate system for the digital transmission of X-ray images, to enable viewing of such images in the four to five regions.	GGDs	Ongoing	
4.1.3. Clinical care			
By 2015, intramural care for people with TB is to be organized based on regional clustering.	Hospitals	Ongoing	
By 2015, each hospital will have a clinical TB coordinator, who will fit the profile and meet the quality criteria of the Dutch Society of Physicians for Respiratory Diseases and Tuberculosis.	Hospitals	Done: three training sessions for hospital TB coordinators	
4.2. Personnel capacity			
By 2015, there are to be at least four TB doctors with appropriate competences working in each of the four or five regions; the actual number will depend on the region's geographical size, the workload and the complexity of the cases.	GGDs	Ongoing	
By 2015, clinical TB coordinator is a formalized position in the clinical care sector, supported by appropriate accreditation or in-service training.	Dutch Society of Physicians for Respiratory Diseases and Tuberculosis	Not yet done	

Objectives	Responsible	Status	Document
By 2015, each of the four or five regions is to have at least one TB nurse with nurse–practitioner competencies.	GGDs	Ongoing; three nurse–practitioners in training	
By 2013, each region will have an annual plan developing the expertise of medical-technical assistants, taking account of the particular regional context and arrangements.	GGDs	Three of four regions have multidisciplinary training	
4.3. Funding			
Before the end of 2011, TB doctors working for municipal health services will be able to recover the costs of interferon-gamma release assays, sputum tests and bacterial identification or resistance tests from health insurers.	GGDs	Done (mid-2013)	
By 2013, the Centre for Infectious Disease Control/RIVM will be able to recover the cost of diagnostic procedures needed for treating people (bacterial identification and additional resistance tests (confirmation, MDR-TB and XDR-TB)) from a health insurer, which will act as a central clearing-house for the other health insurers.	Centre for Infectious Disease Control/RIVM	Done	
Before the end of 2011, the TB centres will have made arrangements with the health insurers regarding the treatment of people with TB, particularly for M/XDR-TB.	TB centres	Done (B segment: freely negotiable between health insurers and hospitals)	
Chapter 5. Surveillance			
By 2012 there is to be a clear, efficient national system of TB surveillance, consistent with national and international obligations.	Centre for Infectious Disease Control/RIVM and KNCV	Done: now at Centre for Infectious Disease Control/RIVM	
Chapter 6. Laboratory diagnostics			
In 2011, only laboratories that operate under BSL III conditions are to produce *M. tuberculosis* cultures.	Health Care Inspectorate	The Health Care Inspectorate will report its inventory results on BSL III and EQC	
From 2011, all laboratories that test for *M. tuberculosis* are to participate in surveys by the Dutch Foundation for Quality Assessment in Medical Laboratories at least once a year.	Health Care Inspectorate		
Chapter 7. Improving control			
By 2015, the Netherlands is to be making a meaningful contribution to European TB control policy.	Centre for Infectious Disease Control/RIVM	To be assessed	
By 2013, the average rate of diagnostic delay is to be no higher than in 2008 (in 2008, 31% of the people with pulmonary TB had no cough, 34% had a cough for less than 3 months, 5% had a cough for more than 3 months and delay or symptoms were not reported for 30%).	KNCV	2011: 31% no cough, 40% <3 months, 7% >3 months, 23% unknown	Van Veen A, Pool K. Cursus voor klinische tbc-coördinatoren in Rotterdam. Tegen de Tuberculose 2012;108:25–7.
At least every second year, the KNCV, the Dutch Society of Physicians for Respiratory Diseases	Centre for Infectious Disease Control/	Done (March 2013)	

Objectives	Responsible	Status	Document
and Tuberculosis and the Centre for Infectious Disease Control/RIVM are to organize a joint conference for professionals working in TB control, with the aim of evaluating progress towards the defined (practical) goals and defining new goals where necessary.	RIVM and KNCV		
By 2015, the TB-related content of basic medical training is to be coordinated and organized to ensure uniformity and acceptable standards.	KNCV	Ongoing	
By 2015, the TB-related content of the training given to pulmonologists (including clinical TB coordinators) and public health physicians (specializing in TB control) is to have been revised to reflect the changes in the relevant competence profiles.	Dutch Society of Physicians for Respiratory Diseases and Tuberculosis/ Erasmus MC	Ongoing	
By 2015, the TB-related content of the training given to public health nurses is to have been revised to reflect the changes in the relevant competence profile.	KNCV	Ongoing	
In the period 2011–2015, each TB control region is to be visited once by the Plenary Visitation Committee of the Committee on Practical Tuberculosis Control	KNCV	Ongoing	
Before the end of 2011, agreement is to be reached regarding the future position and tasks of the clinical consultants (at the TB centres).	KNCV	Completed	
Chapter 8. M/XDR-TB			
By 2012, the WHO guidelines on the systematic monitoring of treatment outcomes among people with M/XDR-TB are to have been implemented in the Netherlands.	Committee on Practical Tuberculosis Control	Discussed in the Committee on Practical Tuberculosis Control in September 2013	
In the years 2011–2015, the Centre for Infectious Disease Control/RIVM is to provide laboratory diagnostic services in connection with M/XDR-TB.	Centre for Infectious Disease Control/RIVM	Completed	
In the years 2011–2015, people with M/XDR-TB are to be treated under the supervision of a TB centre.	TB centres	Completed	
In the years 2011–2015, the training of TB nurses is to include instruction on the supervision of people with M/XDR-TB.	KNCV	Planned in 2014	
Chapter 9. TB and HIV			
By 2013, everyone with TB is to be tested for HIV, and those living with HIV must be referred to an HIV treatment centre.	Hospitals/GGDs	Not all tested (<40% in 2012)	
Chapter 10. Research and innovation			
By 2015 research will have been conducted into:			
• active latent TB infection detection in particular risk groups;		Done	
• evaluation of the DOT nursing intervention;		Not yet	
• the accessibility, quality and effectiveness of			

Objectives	Responsible	Status	Document
TB control with an alternative organizational structure; and		Not yet	
• how the organization of TB control in the Netherlands compares with that in neighbouring countries		Not yet	
Chapter 11. International collaboration			
In accordance with the priorities of WHO and the ECDC, the 2011–2015 period will be dedicated to efforts by the ECDC, the Centre for Infectious Disease Control/RIVM, the KNCV and other institutes to engage in international TB-related collaboration and to offer technical support in TB control in low-prevalence and medium-prevalence European countries.		Ongoing, such as Wolfheze Workshops and the Partnership Programme between the Ministry of Health, Welfare and Sport and WHO	
Chapter 12. TB control in the Netherlands after 2015			
In 2013, an external review of TB control in the Netherlands is to be undertaken.		Completed	
In 2013, a think tank comprising representatives from the Centre for Infectious Disease Control/RIVM, GGD-Nederland, KNCV and the Dutch Society of Physicians for Respiratory Diseases and Tuberculosis is to prepare a policy document outlining the advantages and disadvantages of various organization models of TB control in the period up to 2025. Possible scenarios include maintaining the existing model, with municipal responsibility and regionalization based on collaboration among municipalities, and adopting a model in which the municipal health services and their regional back offices deliver a decentralized national government service in consultation with the other municipal health services in the region, with the option of assigning (parts of) some tasks to clinical specialists or infectious disease doctors.		Planned	
In 2014, decisions are to be made regarding the organization of TB control based on the findings of the external review and the scenario analysis.		Planned	

Annex 5

EXCERPTS OF THE MISSION SUMMARY REPORT

Key findings

1. In the past decade, the TB burden has further declined. The TB notification rate has declined from about 8 per 100 000 population in 2003 to 5.7 per 100 000 in 2012 (40.3 per 100 000 among people born outside the Netherlands and 1.5 per 100 000 among people born in the Netherlands). Since 2002, TB treatment outcomes have been favourable, with an overall stable treatment success rate exceeding 80%. However, in 2012, the MDR-TB treatment success rate was reported at 64%.
2. There is some heterogeneity in the burden of TB with regard to the mean age and nationality of people with TB. In 2012, 73.2% of all TB cases were born outside the Netherlands, and the mean age of new TB cases among people born in the Netherlands was 45.6 years, whereas the mean age of new TB cases among people born outside the Netherlands was 39.5 years. The HIV testing coverage among people with TB has slightly increased to reach 42% in 2012.
3. A countrywide laboratory network exists, but it is suboptimally organized: lacking clearly defined and applied roles and responsibilities for participating laboratory components and types of laboratory tests to be performed at different levels. This also entails recognizing and defining the national reference laboratory and ensuring that the information sent to the Ministry of Health, Welfare and Sport is clearly and transparently communicated. The culture confirmation rate (all TB cases) has declined from about 76% in 2001 to 69% in 2012 (pulmonary TB cases above 85% in 2012). The exact number of laboratories culturing *M. tuberculosis* complex strain is unknown (according to the Health Care Inspectorate, the number is 33, whereas according to RIVM, the number is 40).
4. Internal and external laboratory quality control mechanisms are in place for some procedures, but the number of laboratories requiring quality assurance for TB culturing and drug susceptibility testing is unnecessarily high for a relatively low number of samples, and not all diagnostic tests are included in the quality control.
5. Currently there is a fragmented approach to human resources development regarding TB prevention, care and control personnel, which is also illustrated through the absence of a development plan for TB human resources that includes all stakeholders.
6. There is a considerable risk of losing expertise in TB prevention, care and control of health personnel (with regard to identifying people suspected of having TB, diagnosis and management), since the numbers of people with TB have been further declining and are expected to continue to decline (the total number of TB cases detected was 958 in 2012 and just above 1300 in 2003).
7. The entry screening of asylum-seekers and migrants has been implemented on a legal basis, and entry screening for prisoners has been implemented using a triage system. The evaluation of entry screening of migrants shows a low yield among people from countries with a TB incidence lower than 50 per 100 000 population and also suggests low coverage (45%). Screening of other risk groups varies across regions, and risk groups are only screened for active TB.

8. The availability of information on the risk of reinfection of migrants and asylum-seekers is limited (when travelling regularly to their country of origin). This includes the risk of reinfection after treatment of latent TB infection.
9. There is extensive and long experience with screening of risk groups, and a screening system for active disease is in place. A pilot study assessing the feasibility and cost–effectiveness of screening for latent TB infection has been conducted. About 1750 latent TB infection cases were diagnosed in 2008 and about 1350 in 2012.
10. The national contact investigation guidelines are being updated. The contact investigation guidelines published in 2007 following the "stone-in-the-pond" principle have not yet been universally implemented.
11. The surveillance system for latent TB infection eligible for treatment and latent TB infection treatment outcome is available (84% treatment completed in 2011), and treatment completion of latent TB infection has become more acceptable and has been increasing.
12. The contact investigation of migrant contacts has lower coverage than the contact investigation coverage among the native Dutch population.
13. For some contacts, the contact's home is far away from the TB health care facility where screening is performed and latent TB infection treatment is provided. This challenge will be further accentuated, as the TB burden is expected to further decrease and with a centralization process for TB services ongoing.
14. Diagnosis and treatment of TB is not entirely free of user charges in the Netherlands, as one of very few countries in the EU (the out-of-pocket contribution is €350). Special groups such as unemployed people are exempted from this mandatory copayment.

The mission members also made the following observations, which go beyond but are relevant to the terms of reference.

1. Appropriate TB screening among people living with HIV is carried out at regular (follow-up) consultations and isoniazid preventive therapy is provided. HIV-positive status is considered a TB risk group criterion. About 42% of the people with TB (total in 2012 was 407) are tested for HIV (increased from the percentage of the 2008 TB country review finding; in this review the percentage for 2008 shown was slightly higher than 30%; clearly there has been a general upward trend).
2. There is no formalized centrally based overarching collaborative agreement between TB and HIV (programmes) but generally effective collaboration between the GGDs (the ambulatory public health service) and hospitals. The provider-initiated opt-out approach for testing for HIV in TB services (particularly in hospitals) is not fully in place.
3. The incidence of TB among children is slowly and steadily decreasing. In 2012, 50 cases of TB among children were notified, an incidence of 1.7 per 100 000 population. The low level of TB among children signals low levels of recent transmission in the community. However, second-generation migrants pose a special risk group, with indications of more pronounced frequent recent transmission.
4. Source finding and contact investigation around childhood TB cases was not implemented among as many as two thirds of the children during 2006–2010.
5. Culture confirmation of TB cases among children is very infrequent compared with many other countries. Only 29% of the children had their diagnosis confirmed by culture during

2005–2010. Culture confirmation is more frequent in the diagnosis of passively detected cases compared with active case-finding.

6. Although BCG vaccination of risk groups has been implemented, not all eligible children are vaccinated. As many as half of the children with TB who belong to a target group and who are eligible for BCG vaccination have not been vaccinated.
7. For people with M/XDR-TB, treatment is available with an adequate treatment regimen, including new medicines. Current MDR-TB rates and numbers are low (15–20 cases).
8. TB information material for people with TB and various groups, such as migrants, people who inject drugs, people living with HIV and prisoners is available in different languages and updated (latest update 2013). This information material is visibly displayed and available in relevant health facilities.
9. Some groups of people with TB are insufficiently involved in developing TB information material (such as homeless people, prisoners, immigrants and asylum-seekers), and systematic collaboration is lacking between the health system and other entities in contact with people who may have TB (those administering and running homeless shelters, but generally there is communication with GGDs).
10. The strength of the current governance approach is the well-functioning horizontal governance processes. This refers to collaboration arrangements between stakeholders, such as professional associations, KNCV, RIVM and municipalities. However, there are signs that the vertical coordination by the Ministry of Health, Welfare and Sport does not support effectively the current service delivery and funding model of the organizational structure.
11. Although RIVM, KNCV and GGD collaborate on well-elaborated tools and approaches for surveillance and monitoring of health outcomes, there is no comprehensive performance assessment framework that would enable performance to be assessed from important aspects, such as sustainable funding and efficiency.

Key recommendations

1. Establish a formal laboratory network structure linking a defined national reference laboratory with few regional laboratories, clearly stating which test is performed at each level, to optimize TB diagnosis.
2. Ensure that culturing and drug susceptibility testing for M. tuberculosis complex strains only takes place in a few nationally and internationally quality assured biosafety level III facilities with internal and external quality assurance systems in place (for all diagnostic procedures performed).
3. Send the first positive culture from any new person with TB immediately to the national reference laboratory for genotyping and, if any resistance is reported, conduct phenotypic drug susceptibility testing verification, including that previously detected by molecular methods (to improve the timely delivery of results).
4. Develop a comprehensive TB-relevant human resources plan corresponding to current and any planned service delivery model(s), also taking into account the projected trend of TB epidemiology, including TB expertise with children.
5. Raise and maintain awareness and knowledge about TB among relevant first-line health care personnel (such as general practitioners).

6. Facilitate and harmonize the preparation and communication of TB-related training curricula and courses (including web-based training tools).
7. Discuss implementing latent TB infection screening for high-risk groups in the light of TB elimination even though latent TB infection screening is not cost-effective using the ceiling for the cost–effectiveness of health care interventions.
8. Consider scaling up the implementation of latent TB infection detection and preventive treatment of eligible children, especially among the children of migrants on entry, second-generation migrants and in contacts born outside the Netherlands.
9. Evaluate the coverage of entry screening for migrants and assess whether issuing a residence permit should again be linked to proof of TB screening.
10. Boost and improve the implementation of TB screening, including assessing whether the current follow-up screening by chest X-ray should be replaced by screening of latent TB infection and offer treatment to certain groups with this condition.
11. Develop an implementation plan for the new contact investigation guidelines and monitor implementation, including assurance of optimal contact tracing, also in migrant populations as well as contact tracing and source finding around all childhood cases.
12. Apply innovative information and communication technology solutions to support adherence to latent TB infection treatment, especially if the distance between the contact's home and the relevant care-providing health facility is considerable.

Further, the mission members would like to propose the following recommendations that are indirectly relevant to the terms of reference.

1. Strengthen intra-hospital collaboration and information exchange regarding TB and HIV between infectious disease specialists and pulmonologists through regular case discussions facilitated by TB coordinators.
2. Review the HIV testing approach in TB training schemes and curricula and particularly how HIV testing is discussed and presented to the people with TB by TB health personnel to help fully systematize HIV testing among people with TB.
3. Consider revising and ensure implementation of the BCG vaccination policy to increase coverage in eligible high-risk groups.
4. Involve people with TB and TB high-risk groups in developing TB information material and consider involving people who have or have had TB and TB high-risk groups in developing TB guidelines and protocols.
5. Set up a comprehensive framework for assessing performance that would include measuring the efficiency of the programme. This framework could also synthesize the outputs from the monitoring activities of other main actors, including RIVM, KNCV and local public health TB physicians.
6. Organize a national committee or platform of partnership to improve vertical collaboration in the form of transparent and regular consultation by involving all main stakeholders such as local public health physicians, the Ministry of Health, Welfare and Sport, RIVM and KNCV. The platform would help to speed up the feedback between the different stages of the policy cycle and to improve the alignment between the different functions of the programme.