



# Towards selective tuberculosis screening of people in prison in a low-incidence country

*To the Editor:*

In 2018, 806 tuberculosis (TB) patients were notified in the Netherlands, which was the second lowest number recorded since notification became mandatory in 1980; only 2017 had fewer notified cases ( $n=783$ ) [1]. In this century, TB notification rates in the Netherlands declined by 50%, from 9.3 patients per 100 000 population in 2001 (1492 patients) to 4.7 per 100 000 in 2018. In 2018, 77% of the TB patients were born outside the Netherlands.

Prisoners in many countries in the world have a higher risk for TB due to pre-existing risk factors, poor access to health services and overcrowding conditions [2–8]. In the Netherlands, a radiographic TB screening programme for prisoners was started in 1994 after several outbreaks occurred in prisons. Noteworthy is the contact investigation in 1990 of a prison officer with non-infectious pulmonary TB [9]. The investigation revealed the source patient, a prisoner with smear-positive cavitating pulmonary TB, 41 infections (four had primary TB) among 160 prison officers and other staff investigated, and 49 infections among 260 prisoners and ex-prisoners (also four had primary TB). It led to a nationwide programme with contractual arrangements between the Custodial Services of the Ministry of Justice, responsible for the health of the prisoners, and the Municipal Health Services (MHS), responsible for infectious disease control in their areas. Mobile radiography units (MXU) have been deployed to screen new inmates; for the past 15 years these have all been equipped with digital devices. All prisons, including detention centres for undocumented migrants, are visited weekly, except those for minor aged prisoners. The chest radiographs are read within 24 h by public health TB physicians of the MHS. Findings are recorded in the electronic client registration system of the MHS. The public health TB physician is responsible for further action, which may require the prisoner to visit the MHS for consultation and/or referring the prisoner to a pulmonologist in a hospital, *e.g.* for bronchoscopy. If TB is diagnosed and respiratory isolation or specialised clinical care is required, the prisoner is transferred to a prison with medical facilities including a respiratory isolation unit (one in the country) or to a specialised TB centre (two in the country). Prisoners with non-infectious TB are treated ambulatory in the prison for the duration of their detention. The TB nurse of the MHS offers patient support and enables continuity of care after release from the prison. In 2018, the Netherlands had 24 prisons and three detention centres for undocumented migrants. Four MXUs are used for the prison TB screening programme.

Table 1 shows that 493 092 new entrants in prisons were screened in the years 2001–2018 in the Netherlands. The yield dropped in 2007 and 2008. Therefore, the Ministry of Justice requested the Committee for Practical TB Control (CPT), which is a multidisciplinary platform for TB policy and guideline development in the Netherlands, to evaluate the effectiveness of the screening and advise on a more selective approach [10]. In the Netherlands, a cut-off of a screening yield of 50/100 000 (number needed to screen 2000) has been chosen to decide on continuation or discontinuation of screening [11]. This cut-off was arbitrarily set to limit exposure of healthy individuals to radiation and to increase the effectiveness of screening. The evaluation showed that the yield was particularly low among prisoners born in the Netherlands (33–35 per 100 000 screenings) and below the recommended threshold for TB screening. Based on these findings, the CPT advised to limit radiographic screening of Dutch-born prisoners to those with risk factors (homelessness, illicit drug use, history of previous TB, recent contact



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**Screening all prisoners in low-incidence countries is not effective. Screening data can help to direct screening activities. Continuity of tuberculosis treatment and care is a major concern in prisoners after their release from prison.** <http://bit.ly/2rzn5l8>

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TABLE 1 Number of new entrants in prisons, prisoners screened, tuberculosis (TB) among prisoners (identified by screening or otherwise), screening yield and prevalence of TB among prisoners in the Netherlands, 2001–2018

Year	New entrants in prison n	Prisoners screened n	Coverage of screening	TB among prisoners n	TB diagnosed by MXU screening n	Yield of screening per 100 000	TB not diagnosed by MXU screening n	Prevalence per 100 000
2001	35 000 <sup>#</sup>	26 158	75%	28	17	65	11	80
2002	33 100	25 730	78%	36	25	97	11	109
2003	37 750	29 079	77%	36	26	89	10	95
2004	45 379	37 752	83%	42	32	85	10	93
2005	54 790	46 702	85%	25	25	54	0	46
2006	54 851	44 546	81%	46	46	103	0	84
2007	51 366	42 467	83%	13	13	31	0	25
2008	48 078	40 248	84%	21	15	37	6	44
2009	46 285	39 072	84%	33	27	69	6	71
2010	46 052	37 464	81%	29	23	61	6	63
<b>Total 2001–2010</b>	<b>452 651</b>	<b>369 218</b>	<b>82%</b>	<b>309</b>	<b>249</b>	<b>67</b>	<b>60</b>	<b>68</b>
2011	46 231	22 779	49%	30	22	97	8	65
2012	44 352	20 412	46%	22	17	83	5	50
2013	43 307	18 494	43%	20	17	92	3	46
2014	44 218	15 309	35%	16	13	85	3	36
2015	40 587	14 200	35%	6	4	28	2	15
2016	35 957	12 222	34%	15	13	106	2	42
2017	35 664	10 466	29%	20	13	124	7	56
2018	35 241	9 929	28%	7	7	71	0	20
<b>Total 2011–2018</b>	<b>325 557</b>	<b>123 811</b>	<b>38%</b>	<b>136</b>	<b>106</b>	<b>86</b>	<b>30</b>	<b>42</b>
<b>Total</b>	<b>778 208</b>	<b>493 029</b>	<b>63%</b>	<b>445</b>	<b>355</b>	<b>72</b>	<b>90</b>	<b>57</b>

MXU: mobile radiography unit. #: estimated number.

with a TB patient, known disorders of the immune system or previous imprisonment in a foreign country) or with TB symptoms; and to continue screening of all foreign-born prisoners. This selective approach was implemented on 1 January, 2011. A second evaluation resulted in adjustment of the screening criteria. Since 1 July, 2016, the following criteria are used: 1) prisoners born in a country with a World Health Organization (WHO) estimated TB incidence  $\geq 10/100\,000$ , and 2) prisoners from all other countries if they have a history of previous TB, previous imprisonment in a foreign country during the last 5 years or those with symptoms suggestive of TB.

During 2001–2018, a total of 445 prisoners with TB were notified in the Netherlands; 355 (80%) were identified by the radiographic screening programme, 75 (17%) due to presentation of symptoms, six (1%) through contact investigation and nine (2%) by other ways of active case finding or with unknown mode of detection (data from the National TB Register). The patients had the following characteristics: 93% were male; median age was 32 years; 82% were born outside the Netherlands; 90% had pulmonary TB (128 with positive microscopy of sputum smears or bronchoalveolar lavage, *i.e.* 29% of all patients); 84% had positive *Mycobacterium tuberculosis* complex culture results (six had a combined rifampicin and isoniazid resistant (*i.e.* multidrug resistance) TB, one rifampicin resistant TB and 20 isoniazid resistant TB), 11% had a previous history of TB and 4% had an HIV co-infection. Prisoners with TB identified by the radiographic screening programme had more often pulmonary TB than prisoners diagnosed outside the screening programme with TB (96% *versus* 64%;  $p < 0.01$ ) and were more often foreign-born (85% *versus* 71%;  $p < 0.01$ ). Culture confirmation rates were similar for patients diagnosed by screening or otherwise (86% *versus* 80%;  $p = 0.06$ ).

We divided the study into two periods: “2001–2010” when all prisoners were eligible for screening and “2011–2018” when screening was selective. The TB rate among all new inmates was 68 per 100 000 in 2001–2010 and 42 per 100 000 in 2011–2018, indicating a lower TB risk for prisoners in the latter period (table 1). The yield of the radiographic screening increased from 67 per 100 000 in 2001–2010 to 86 per 100 000 persons screened in 2011–2018, due to the more targeted screening approach. As a result, the proportion of new inmates screened reduced from 82% in 2001–2010 to 38% in 2011–2018. In both periods similar proportion of notified prisoners with TB were found by screening (81% and 78% respectively). These data indicate that the triage criteria adequately identified prisoners with a higher risk of TB among the prisoner population. The total costs of the screening programme, however, hardly reduced since most of the costs are a result of operating the weekly MXU screening service. Currently, less costly options are being considered, such as screening prisoners for latent TB infection, as has been suggested by others [12, 13].

Continuation of treatment and treatment completion of prisoners with TB is challenging [14]. In the Netherlands, the duration of detention is usually short: 26% of prisoners are incarcerated for less than 2 weeks and 73% less than 3 months [15]. Consequently, prisoners are often released from detention while still on treatment. Undocumented migrants with TB are legally allowed to complete TB treatment in the Netherlands. Of the prisoners with TB in our study (cohort 2001–2017; results of 2018 are not yet available), 66.2% completed treatment, 14.8% discontinued treatment and 18.4% had unknown treatment results, often because the person left the country, and 0.5% (n=2) died. So, despite several arrangements and interventions, the results of TB treatment of prisoners are less favourable than for other TB patients in the Netherlands, which is close to 90%.

Our practice demonstrates that through periodic evaluation it is possible to identify the risk populations among prisoners in a low burden country and adapt the screening methods accordingly. The TB rate among the prisoners' population eligible for screening is comparable with the higher rates found in prisons in Western European countries [14, 16], *i.e.* about 10 times higher than in the general population. Our study also shows that prisoners with TB are at risk for less favourable treatment outcomes. Achieving continuity of care after release from prison remains a major concern in the management of TB in prisoners.

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