

Virtual Clinic Models for Managing Remote Care

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Declaration of Conflict of Interest



I, Richard Long declare that in the past 3 years:

I have received manufacturer funding from the following companies*: No

I have done consulting work for the following companies*: No

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**pharmaceutical or medical/dental equipment*

The TB Clinic

The concept of a “tuberculosis dispensary” was originally developed by Sir Robert Philip in Edinburgh in 1897 in response to the limitations of mainstream medical management.*

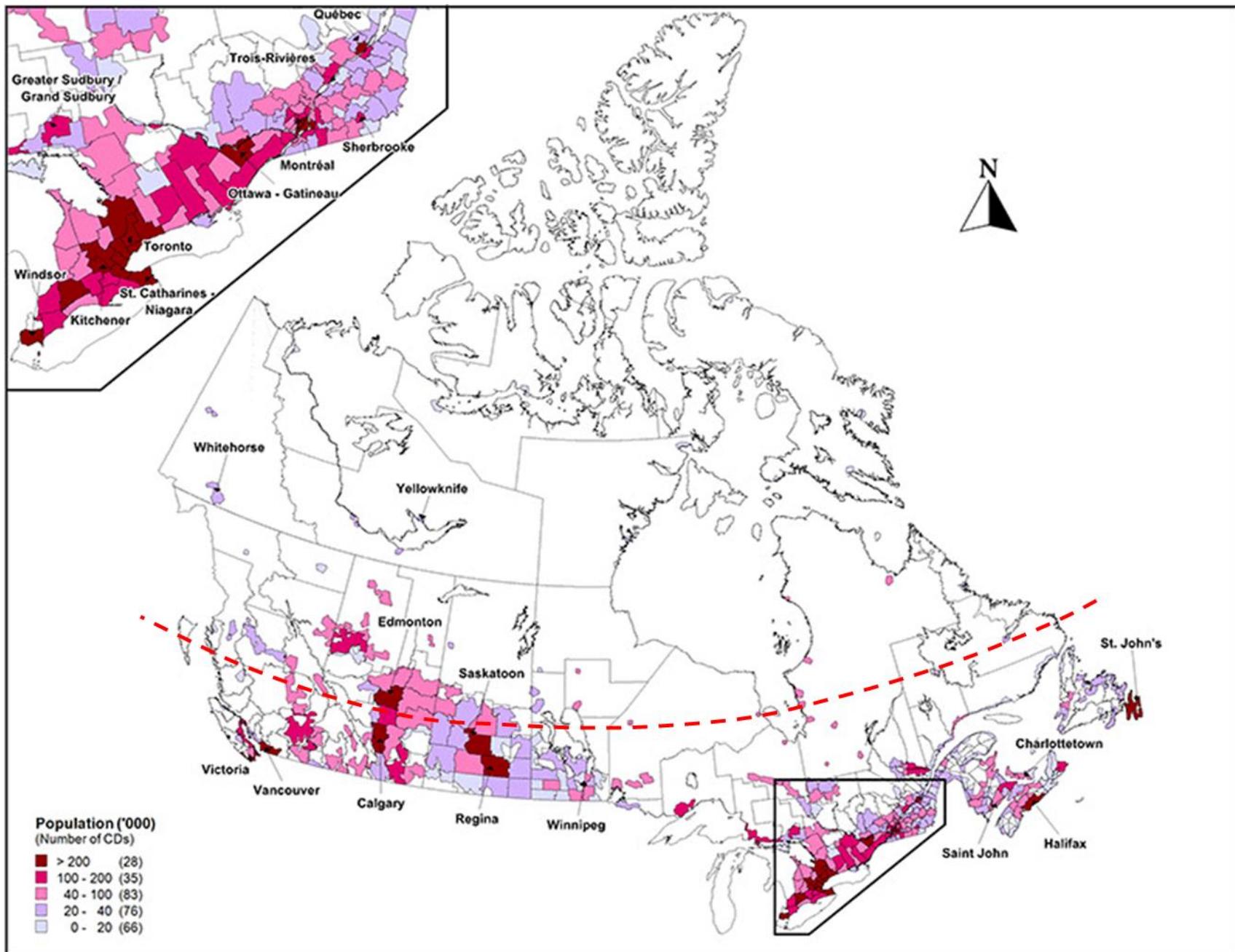
In 1964 Canadians called for urgent improvement and extension of chest clinic services, as well as a sharply increased awareness of the many pitfalls of prolonged self medication.†

*Keers RY. Pulmonary Tuberculosis: A Journey Down the Centuries

† Can J Public Health 1964; 55; 323-33

Contemporary TB Programming in Canada faces five acknowledged challenges

1. The disease is less common but often more difficult to treat (HIV/AIDS; drug resistance).
2. The disease is concentrated in two minority groups – foreign-born and Indigenous peoples.
3. The disease, while geographically focal in its spread, can occur anywhere at any time.
4. The management of the disease is a highly collaborative enterprise involving many stakeholders.
5. The management of the disease is presupposed to be equitable.

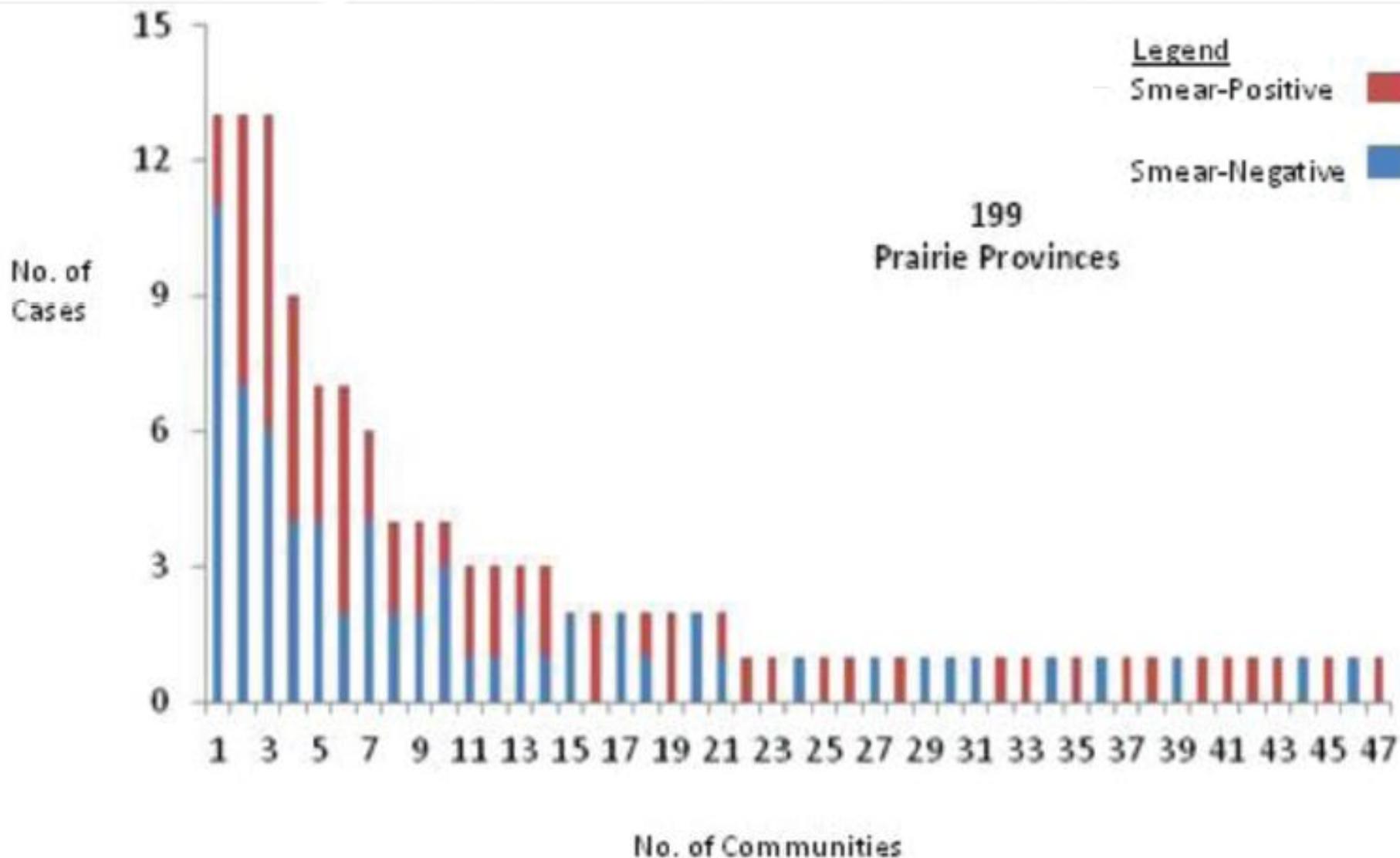


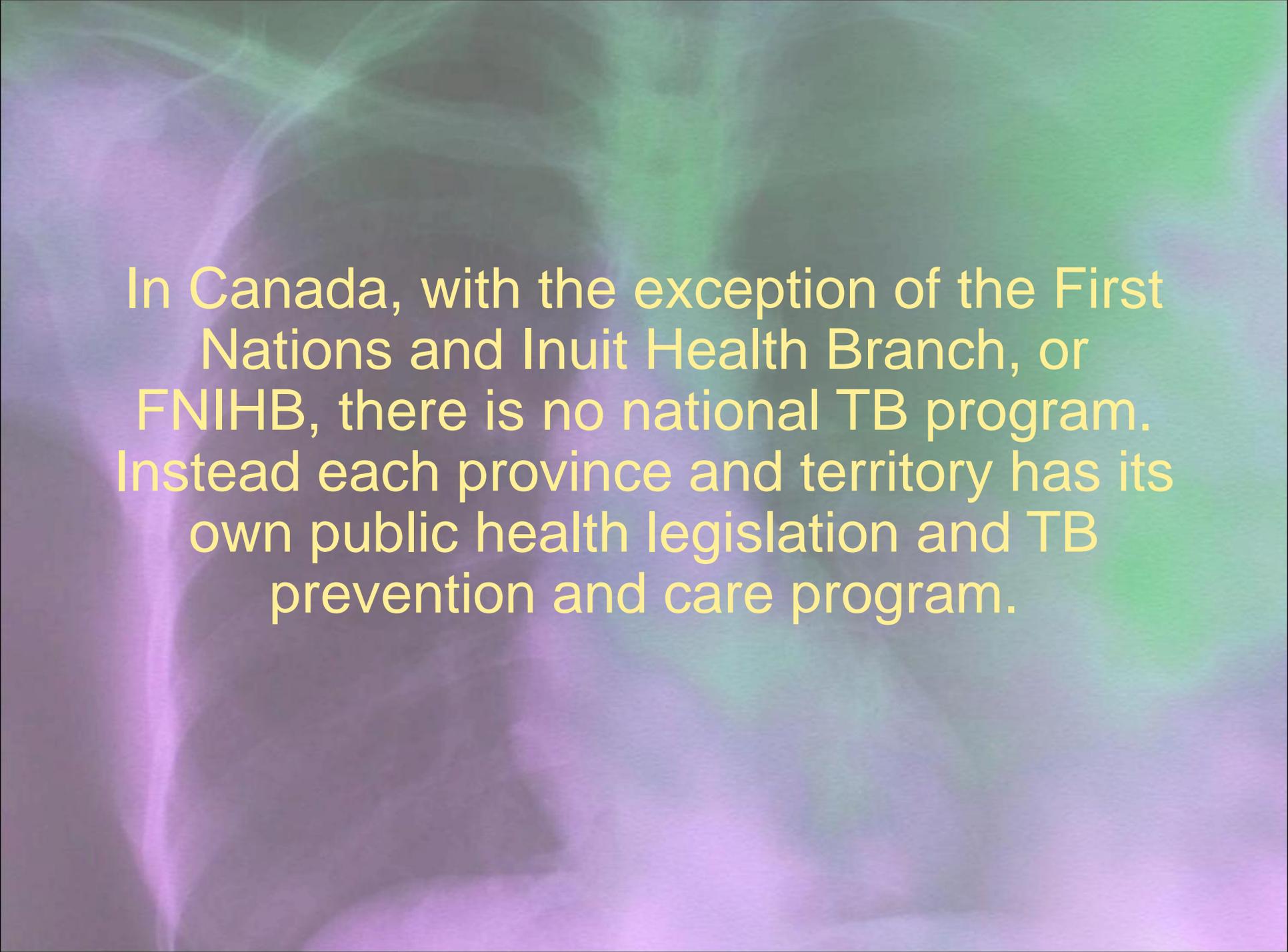
Source: Demography Division, Statistics Canada

In 2007-2008, 131/157 (83.4%) of the on-reserve Registered First Nations and in-settlement Métis pulmonary cases on the prairies resided north of the 53rd parallel.



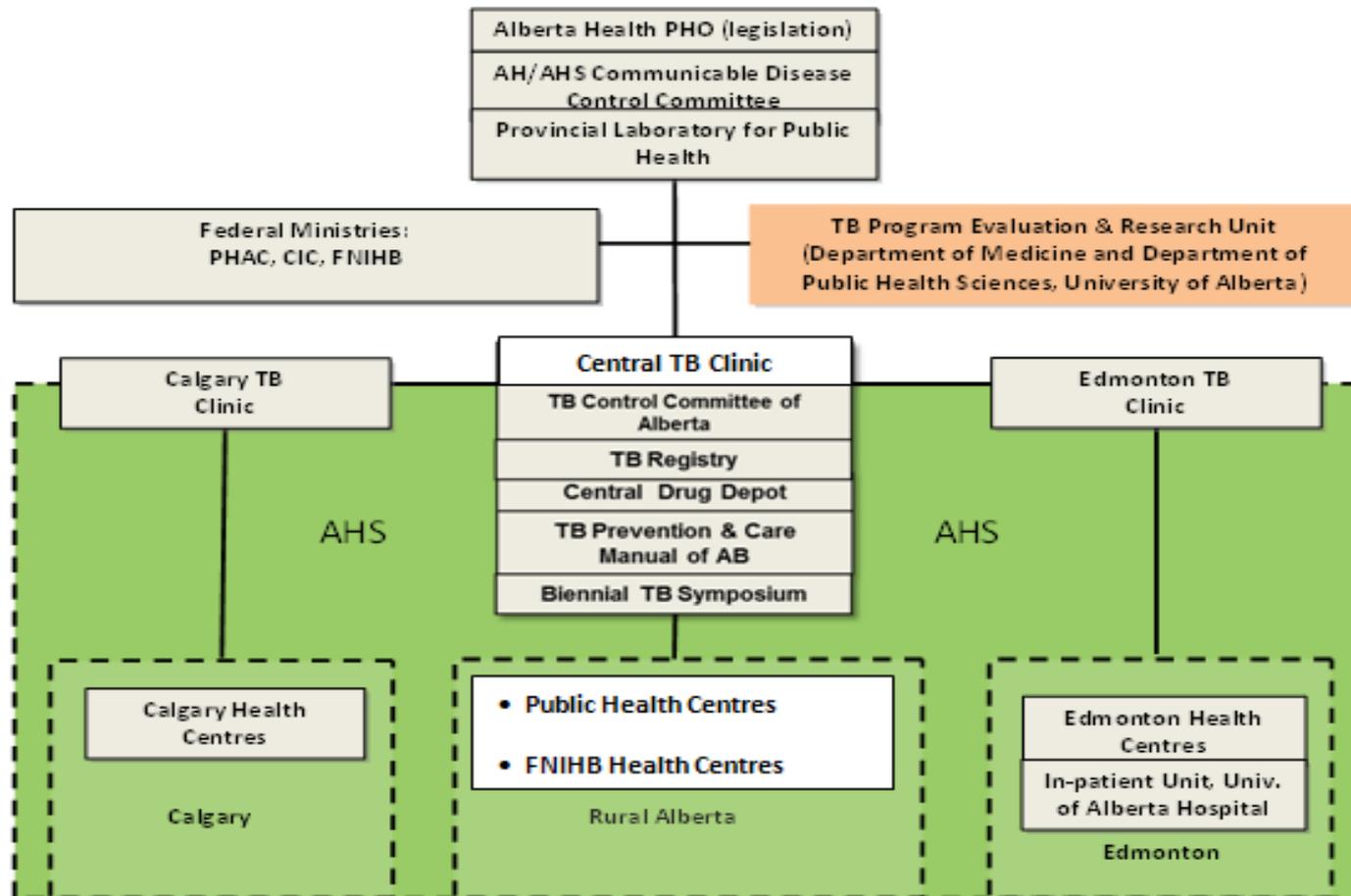
Frequency distribution of on-reserve Registered First Nations pulmonary tuberculosis cases on the prairies, 2007-2008





In Canada, with the exception of the First Nations and Inuit Health Branch, or FNIHB, there is no national TB program. Instead each province and territory has its own public health legislation and TB prevention and care program.

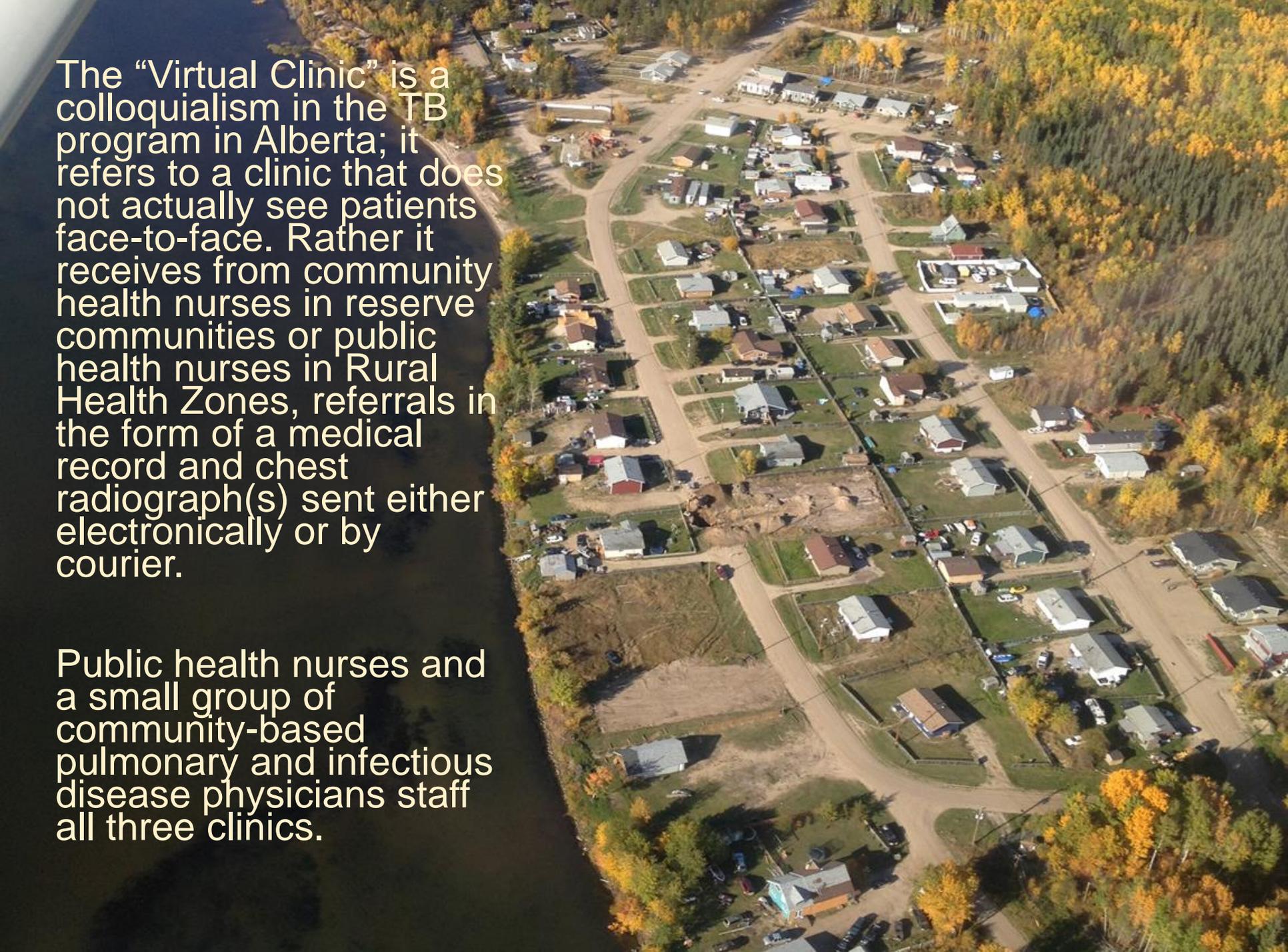
TB Prevention and Care Program of Alberta



Area: 661 848 km²

**Population: 3, 645, 257
(Statistics Canada, 2011)**



An aerial photograph of a rural community. On the left, a wide river flows. The middle ground shows a cluster of houses and buildings, some with large yards and barns. To the right, a dense forest of trees with yellow and orange autumn foliage borders the community. The overall scene is a typical rural landscape.

The “Virtual Clinic” is a colloquialism in the TB program in Alberta; it refers to a clinic that does not actually see patients face-to-face. Rather it receives from community health nurses in reserve communities or public health nurses in Rural Health Zones, referrals in the form of a medical record and chest radiograph(s) sent either electronically or by courier.

Public health nurses and a small group of community-based pulmonary and infectious disease physicians staff all three clinics.

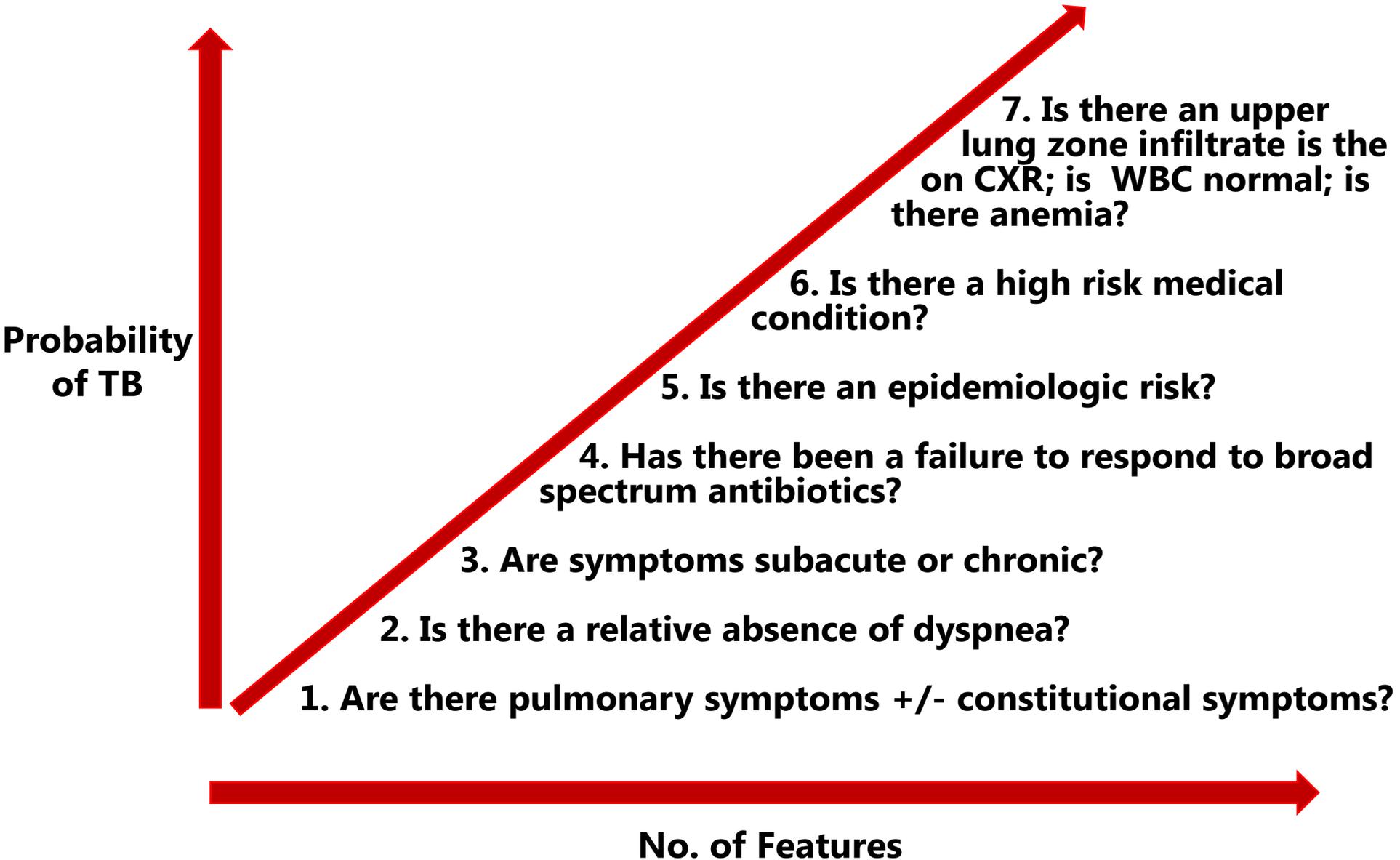
The establishment of the virtual clinic in 1999 united the separate rural components of the program by providing centralized expertise to sparsely populated areas, especially important as case load falls, and enabling 'management-in-place' of on-reserve First Nations.

In addition to recognizing the negative history attached to the removal of First Nations to distant sanatoria, it resembles the neighbourhood clinics described by Curry, serving patients who are often at a lower socioeconomic level, less well educated and living in overcrowded substandard housing.





Suspecting Pulmonary TB



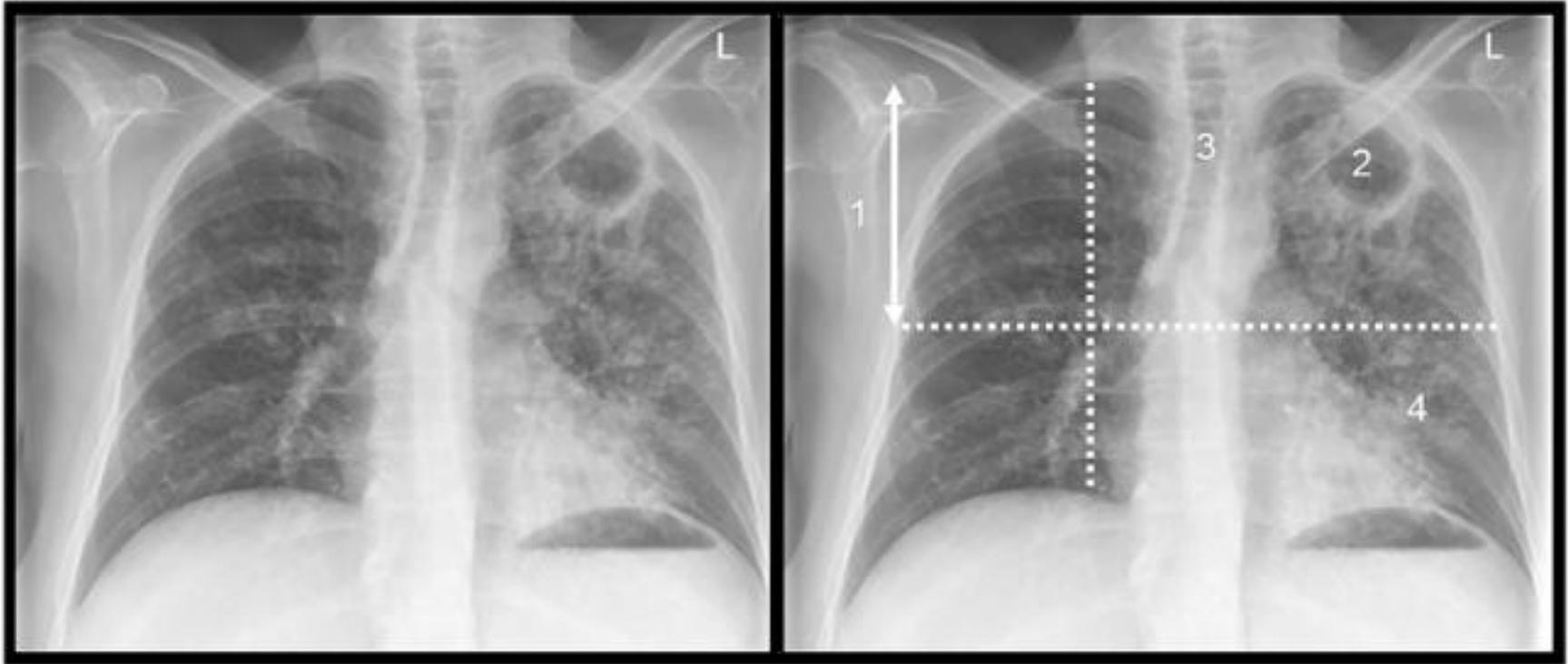
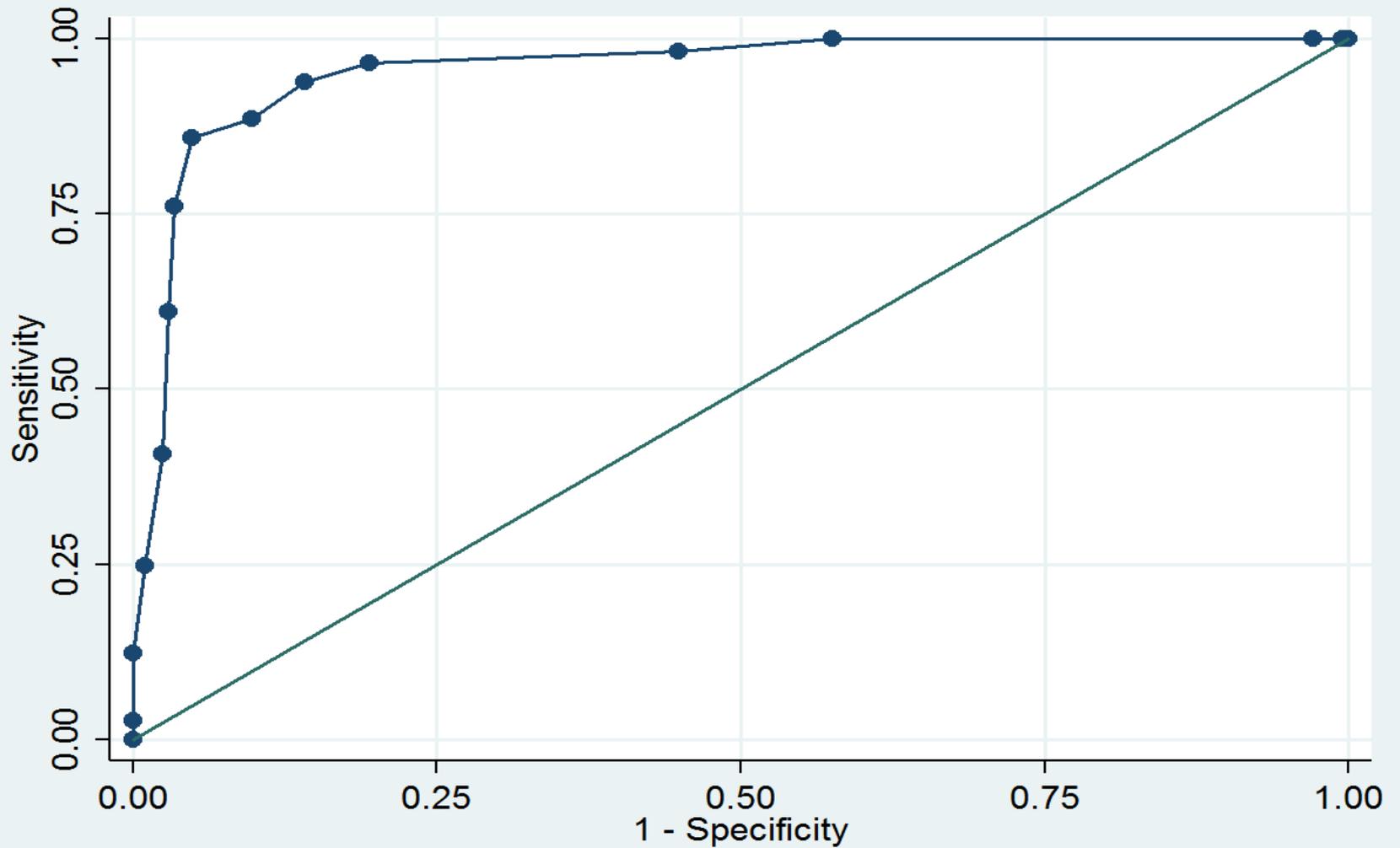


Fig 1. A posterior-anterior chest radiograph in a patient with typical adult-type smear-positive pulmonary tuberculosis. The major features are: (1) upper lung zone distribution; (2) cavitation; (3) volume loss; (4) acinar shadows.



Area under ROC curve = 0.9549

Obs	ROC Area	Std. Err.	—Asymptotic Normal— [95% Conf. Interval]	
318	0.9549	0.0114	0.93245	0.97733

Table 1 Age- and sex-adjusted TB case rates in Alberta, by population group and time period

Population group	Time period	py /100 000	Cases* <i>n</i>	Crude rate /100 000 py	95%CI	Adjusted rate /100 000 py	95%CI
Status Indian	1989–1998	7.0	278	39.9	35.4–44.9	63.8	57.9–69.7
	1999–2008	9.3	163	17.5	15.0–20.4	26.4	23.1–29.7
Canadian-born 'other'	1989–1998	209.3	400	1.9	1.7–2.1	2.3	2.1–2.5
	1999–2008	252.1	212	0.8	0.7–1.0	0.8	0.7–0.9
Foreign-born	1989–1998	41.2	898	21.8	20.4–23.3	18.5	17.2–19.8
	1999–2008	51.7	920	17.8	16.7–19.0	16.7	15.6–17.8
All population groups	1989–1998	257.5	1576	6.1	5.8–6.4	6.5	6.2–6.8
	1999–2008	313.1	1295	4.1	3.9–4.4	4.0	3.8–4.2

* Case numbers in 1989–1998 differ slightly from those reported previously,² mainly on account of having applied, in the interim and retrospectively, a strict case definition for pediatric TB.¹⁶

TB = tuberculosis; py = person-years; CI = confidence interval.

Table 2 Age- and sex-adjusted tuberculosis case rates in Status Indians, by place of residence

Place of residence	Time period	py /100000	Cases <i>n</i>	Crude rate /100000 py	95%CI	Adjusted rate	
						/100000 py	95%CI
Status Indians*							
On-reserve	1989–1998	4.6	200	43.4	37.6–49.9	75.1	67.2–83.0
	1999–2008	6.0	122	20.2	16.8–24.1	34.4	29.7–39.1
Off-reserve	1989–1998	2.4	75	31.8	25.0–39.9	39.3	31.3–47.3
	1999–2008	3.2	41	12.6	9.1–17.1	15.5	11.2–19.8

*The reserve status of three Status Indians and the region of birth of one foreign-born person were unknown.

py = person-years; CI = confidence interval;

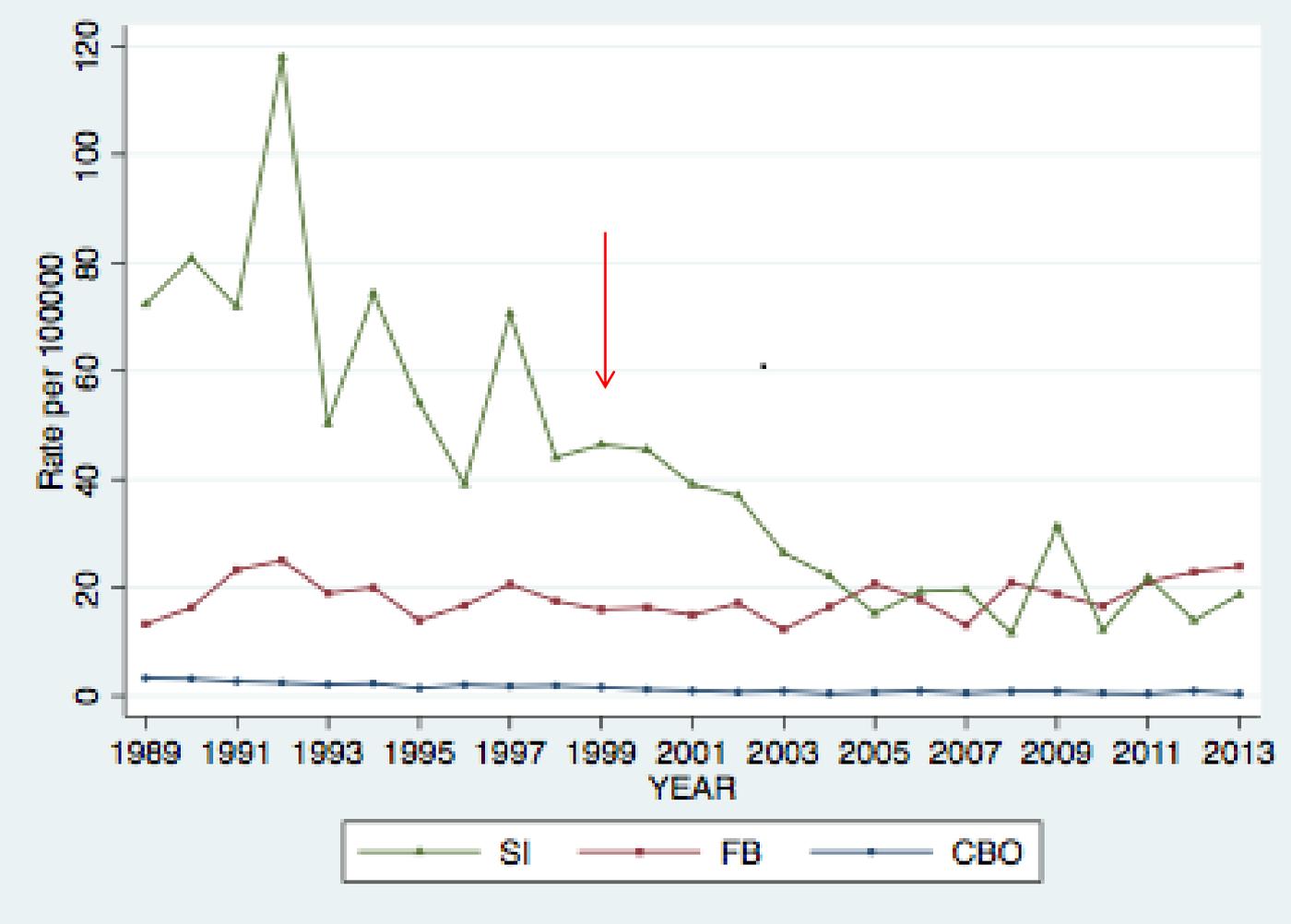
Table 3 Treatment outcomes, associated pediatric cases and close contact evaluations of culture-positive pulmonary TB on-reserve adult cases aged ≥ 15 years, 1989-1998 and 1999-2008

Performance indicators	1989–1998 <i>n</i> (%)	1999–2008 <i>n</i> (%)	<i>P</i> value
PTB cases	106 (100.0)	76 (100.0)	
Incident pediatric cases [†]	36	8	
Pediatric cases/PTB case	0.34	0.11	0.0003
Close contacts of PTB cases [‡]	1699	1664	
Number of subjects assessed	1348 (79.3)	1486 (89.9)	<0.0001
Close contacts of PTB cases who were recommended LTBI treatment	428	359	
Total number who accepted LTBI treatment	313 (73.1)	229 (63.8)	0.005
Number of subjects who completed LTBI treatment	202 (64.5)	195 (85.2)	<0.0001
Non-adherent/lost to follow-up subjects	51 (16.3)	19 (8.3)	0.006

[†]A uniform case definition was applied to pediatric cases.¹⁶

[‡]The same data abstraction tool was applied in each decennial; see Appendix. PTB = pulmonary tuberculosis; DOT = directly observed therapy; LTBI = latent tuberculosis infection.

AGE AND SEX ADJUSTED INCIDENCE OF TUBERCULOSIS IN ALBERTA, 1989-2013



In 2008-2012, TB cases in Alberta were grouped according to clinic type and performance indicators were grouped according to objective category

- **TB case management (10 indicators)**
- **TB treatment outcome (6 indicators)**
- **TB contact management (12 indicators; 6 indicators in two age groups were assessed in close contacts of two different random samples of smear-positive pulmonary TB cases)**

Tuberculosis case characteristics by clinic site of care, Alberta, 2008-2012

Characteristic	Clinic Site of Care			p-value
	All Clinics n (%)	Virtual Clinic n (%)	Outpatient Clinics n (%)	
No. Assessed	841	150 (18)	691 (82)	NA
Population Group				0.0001
CB Indigenous	100 (12)	70 (47)	30 (4)	
CB Other	81 (10)	19 (13)	62 (9)	
Foreign-Born	660 (78)	61 (41)	599 (87)	

CB: Canadian-Born

Table 3 Tuberculosis Treatment Outcome Indicators by Clinic Site of Care, Alberta, 2008-2012

Indicator	Target (%)	Clinic Site of Care*			p-value
		All Clinics n (%)	Virtual Clinic n (%)	Outpatient Clinics n (%)	
TB cases		841	150	691	
Number Tx with DOT †	100	789 (96)	145 (100)	644 (95)	0.004
		[15]	[5]	[10]	
Culture-positive TB cases		709	131	578	
Number relapsed within 2 years †	<3	3 (<1)	0 (0)	3 (1)	1.00
		[68]	[13]	[55]	
Number with TB-related death §	<5	24 (4)	8 (6)	16 (3)	0.063
		[4]	[5]	[19]	
CB culture-positive TB cases		138	80	58	
Number with initial drug resistance	<4	3 (2)	2 (3)	1 (2)	1.00
		[0]	[0]	[0]	
Smear-positive PTB cases		237	50	187	
Number Tx within 72 hr. of PCR †	>90	206 (88)	41 (85)	165 (89)	0.32
		[4]	[2]	[2]	
Number completing Tx within 12 mo. †	≥95	199 (95)	39 (93)	160 (96)	0.42
		[28]	[8]	[20]	

Abbreviations: TB tuberculosis; Tx treatment; DOT Directly-Observed Therapy; CB Canadian-born; PTB pulmonary tuberculosis; PCR Polymerase Chain Reaction

* See text for definition of clinic type

† Those who died without treatment are listed in square brackets beneath the indicator result and excluded from the denominator

‡ Those who were TB deaths or transferred out are listed in square brackets beneath the indicator result and excluded from the denominator

§ Those who died without treatment or transferred out are listed in square brackets beneath the indicator result and excluded from the denominator

Results

Individually and together both types of clinics met most performance targets. Compared to outpatient clinics, virtual clinic performance was comparable, superior and inferior in 22, 3, and 3 indicators, respectively.

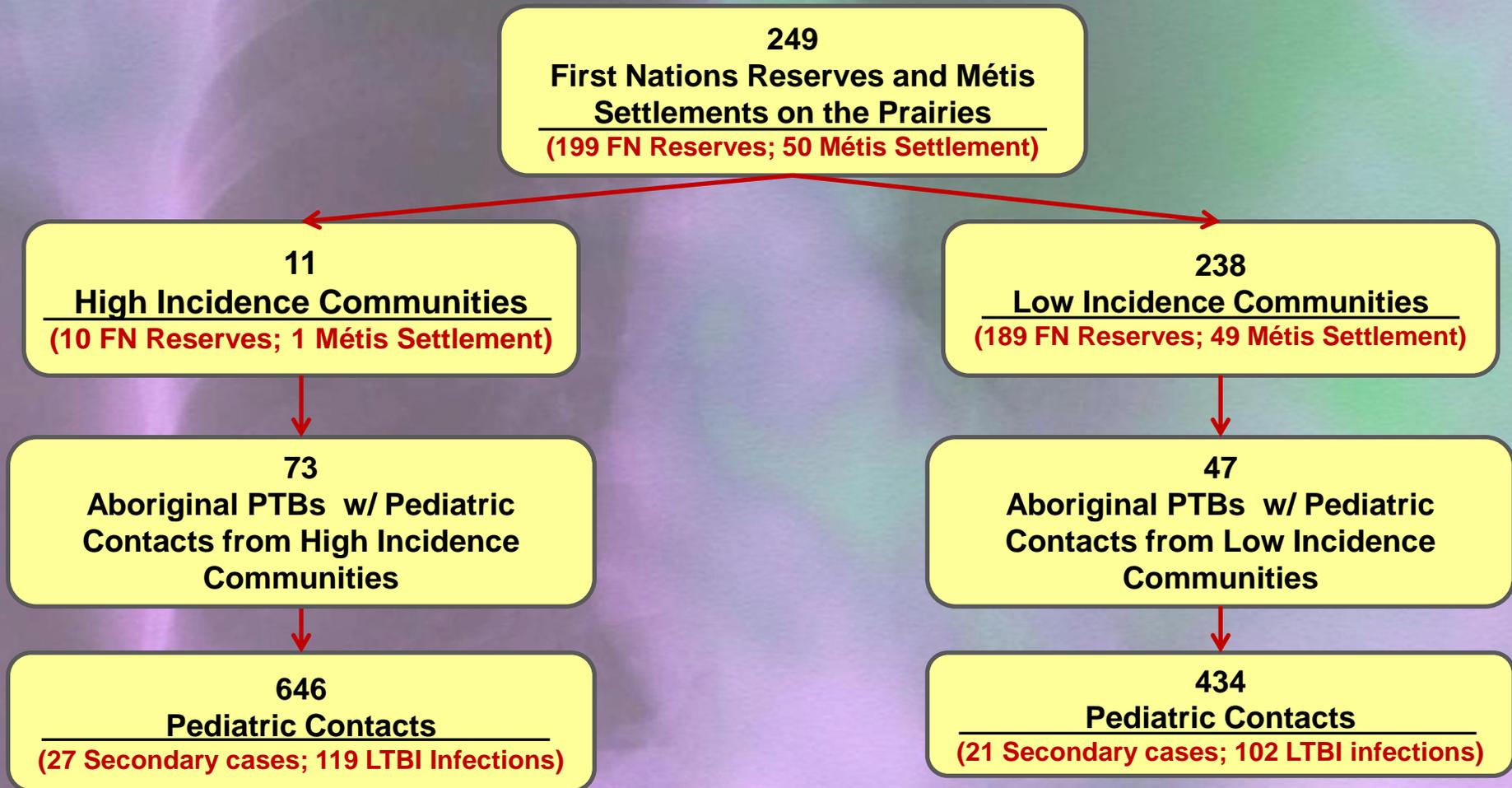
There was no difference in the performance of the “virtual clinic” in cases reported to be “on” versus “off” reserve at the time of diagnosis.

Conclusion

Outpatient and virtual public health TB clinics perform equally well. In low-incidence settings a combination of the two clinic types has the potential to address issues around equitable service delivery and declining expertise.

Limitation: The outbreak or high-incidence community

On the Prairies in 2007-2008 there were 249 Indigenous communities and 120 “potential TB transmitters” with pediatric contacts:



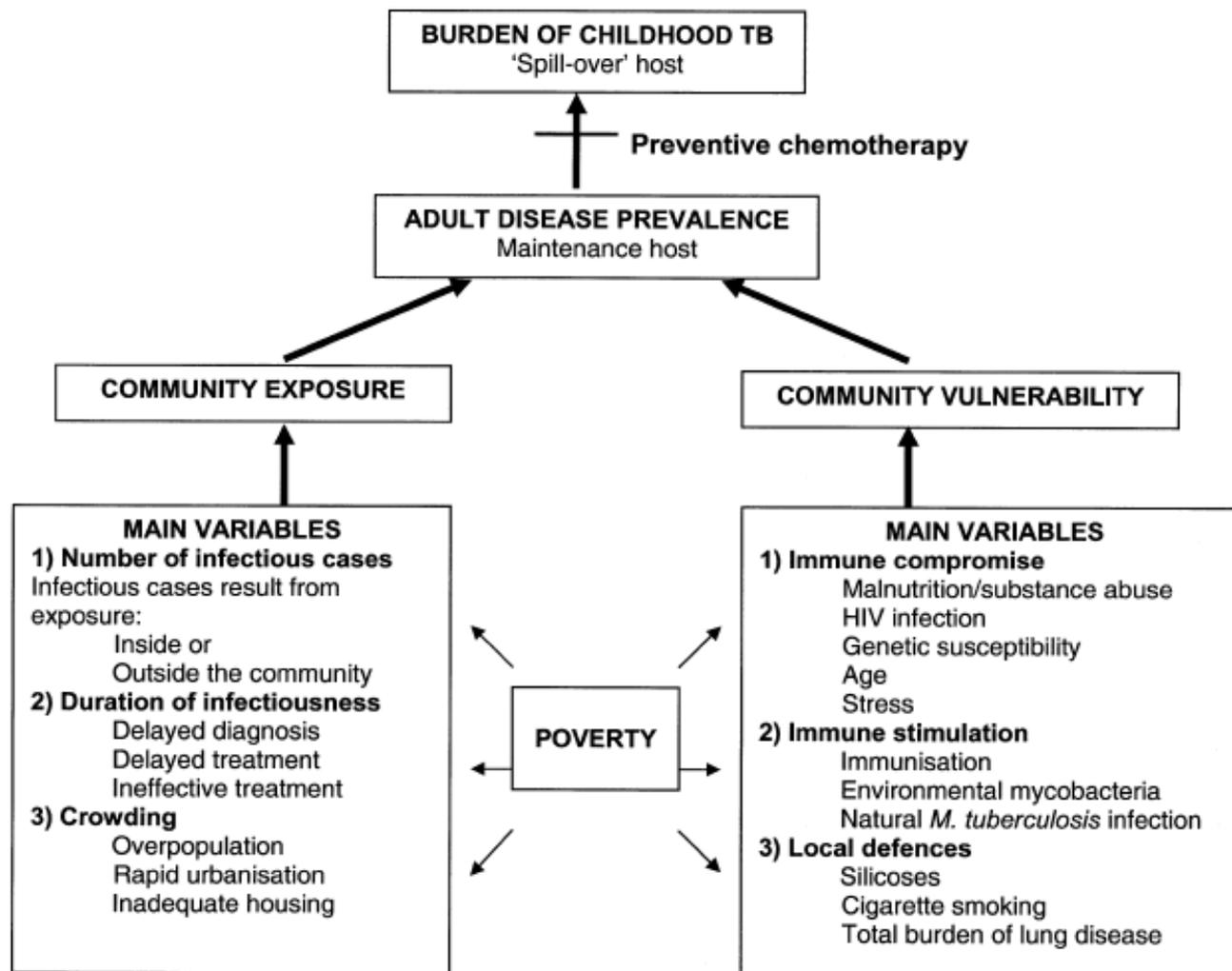


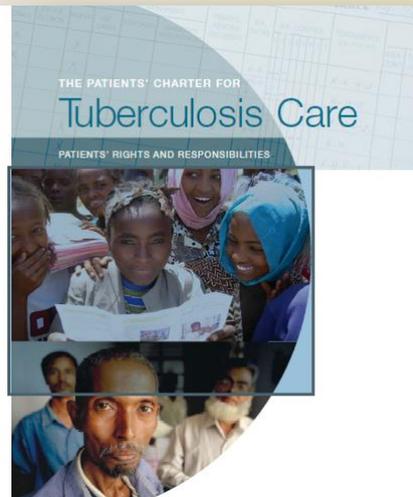
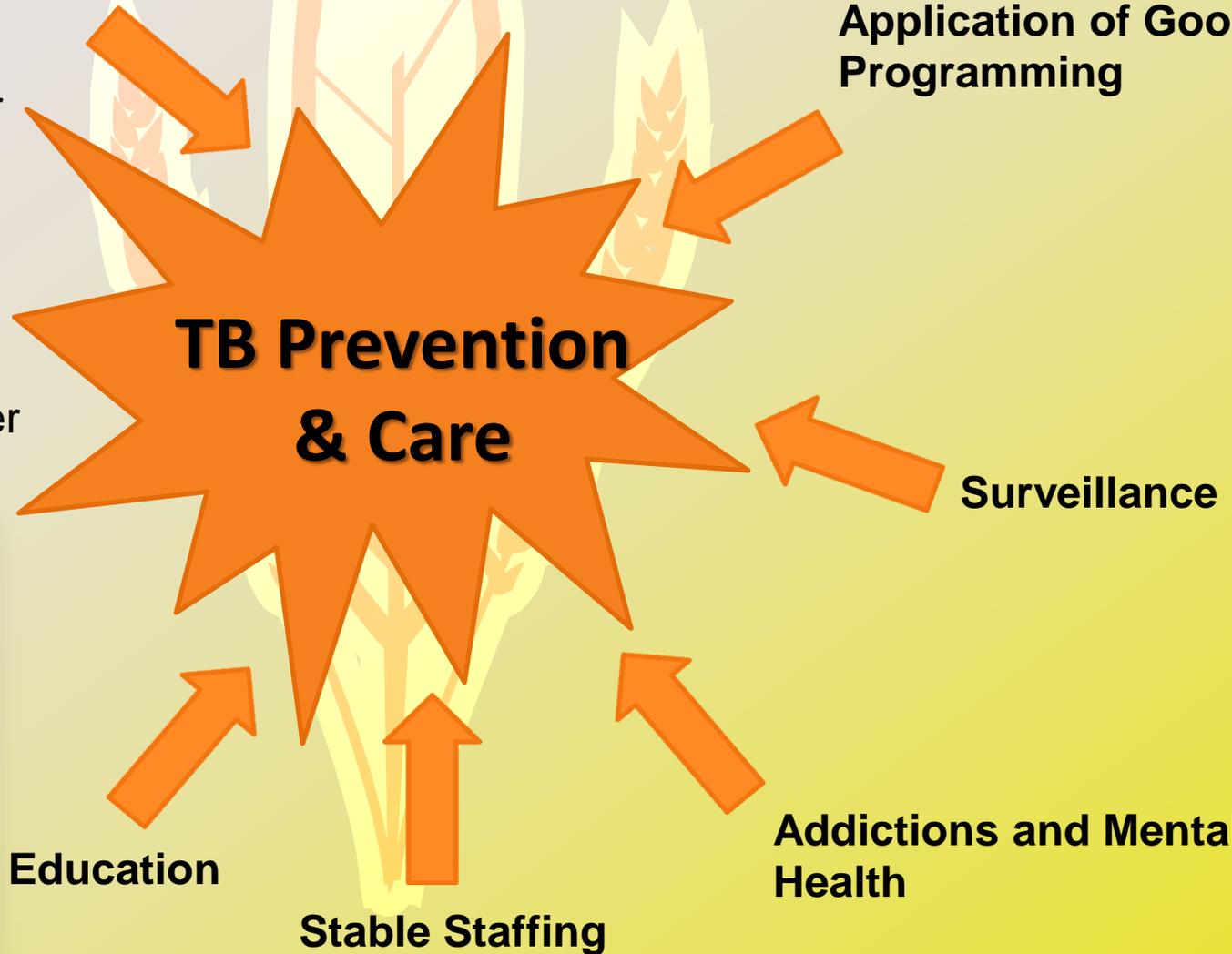
Figure The main variables that contribute to the prevalence of TB in adults and by extrapolation the burden of childhood TB. TB = tuberculosis; HIV = human immunodeficiency virus.

Outbreak and High-Incidence Communities

Community Engagement

- Health Director
- CHN
- CHR
- Elders x2
- FNIHB
- Province
- Service Provider

Compulsive Application of Good Programming



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Questions?

