Epidemiology of TB and NTM in South Korea

Young Ae, Kang

Yonsei University College of Medicine

Epidemiology of TB and NTM in South Korea

- Epidemiology of TB in South Korea
- Epidemiology of NTM in South Korea
- Clinical implications of TB/NTM epidemiology in South Korea

TB epidemiology in South Korea

- Impact of Population Aging on Tuberculosis epidemiology
- RR/MDR-TB status in South Korea

Korea TB notification Status

❖ Last TB notification data (2024)

17,944
Total TB cases

35.2
Cases per 100,000 population

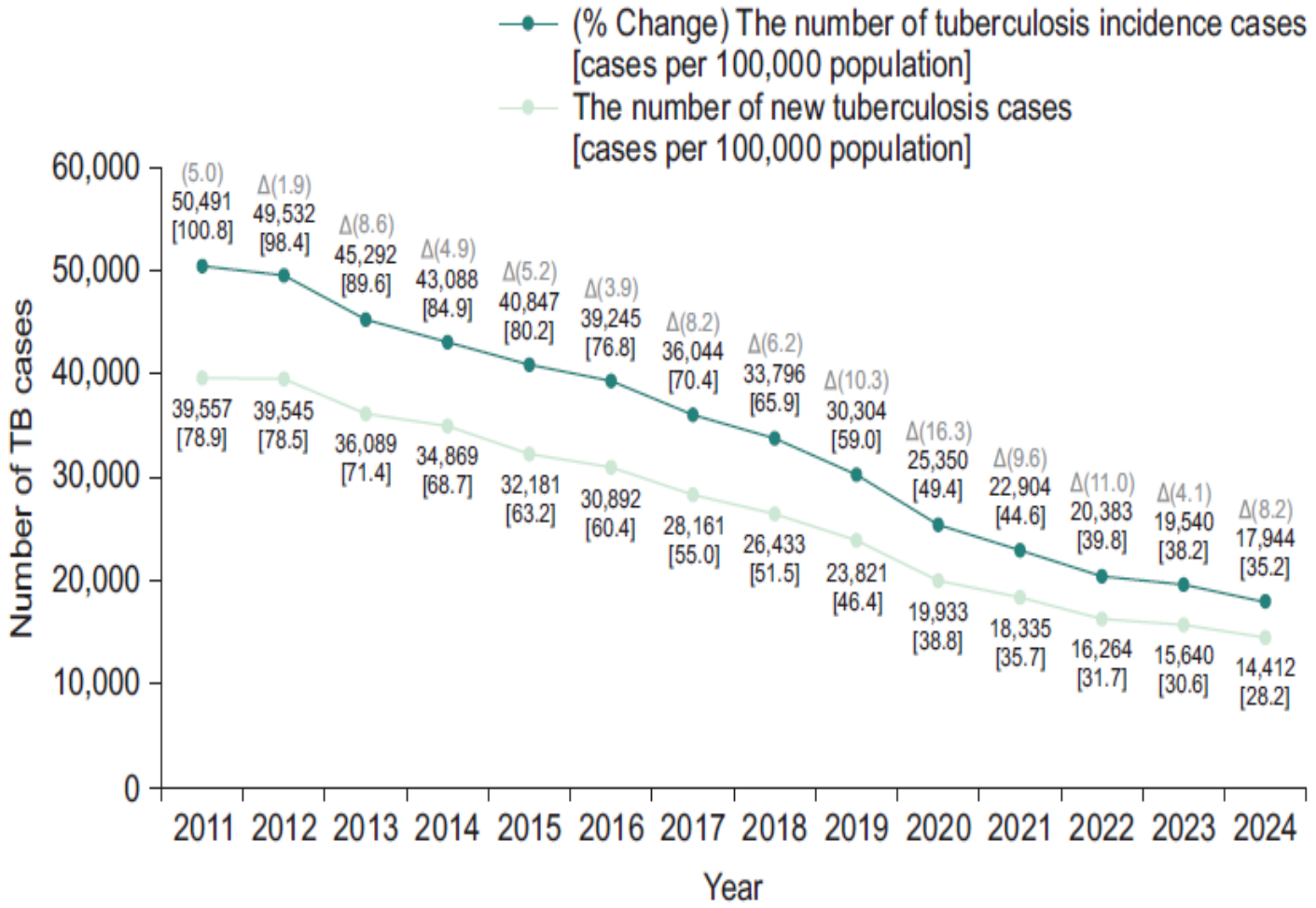
-8.2%
Change from previous year

TB cases have decreased by 64.5% since 2011

13 consecutive years of decline

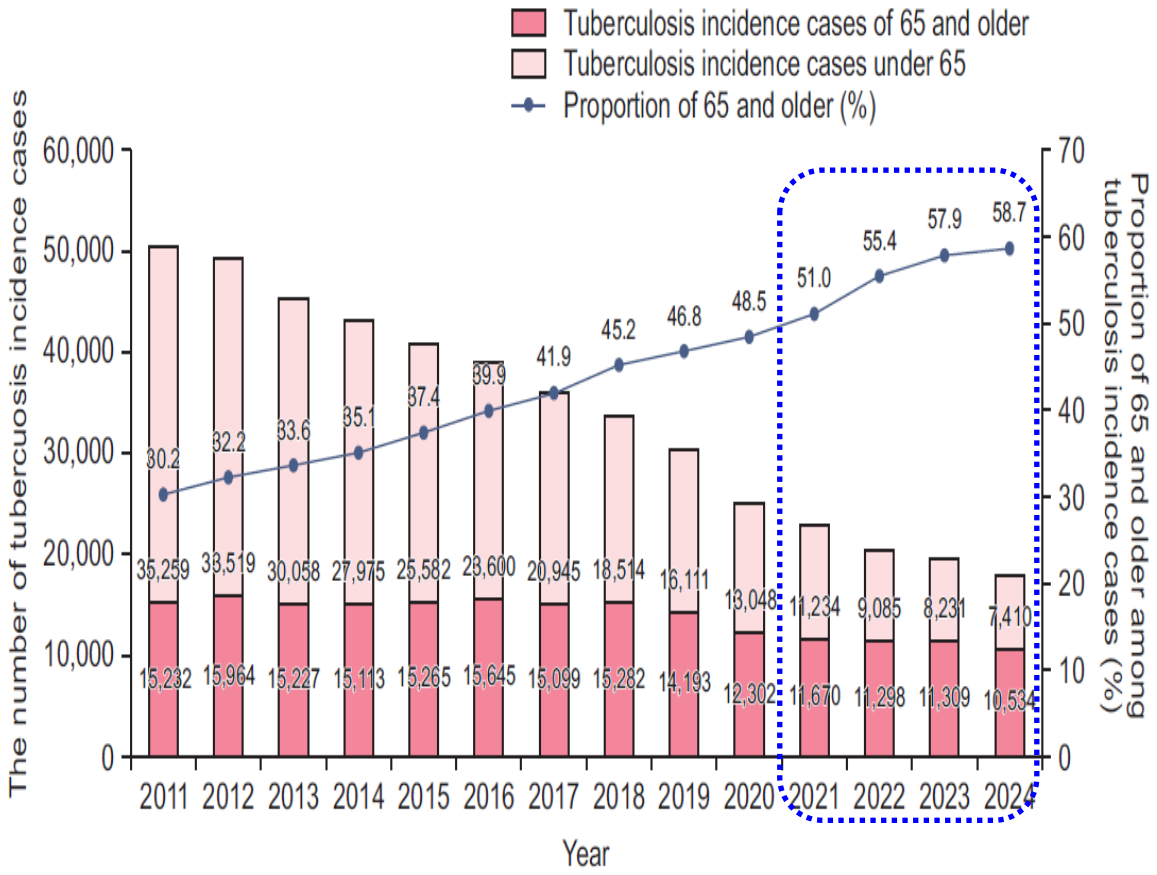
Key Demographics

58.7% Cases occur in individuals aged 65+
(10,534 of 17,944 cases)

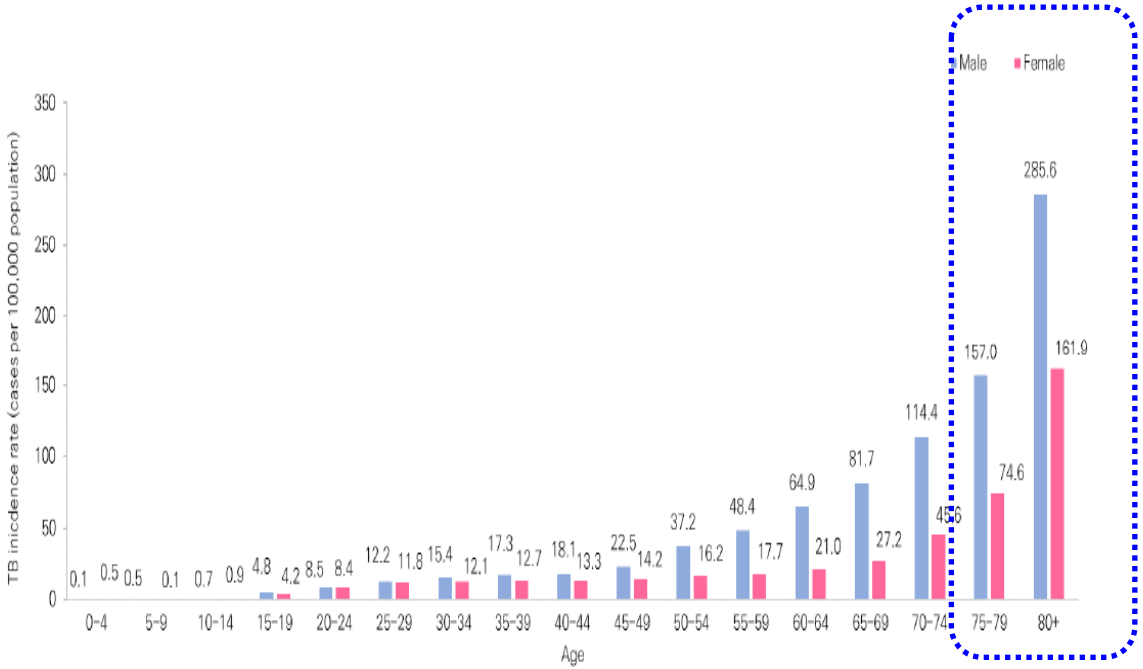


PHWR 2025;18

Korea TB notification Status



- 75-79 years: 111/10^5 pop
- 80+ years : 205/10^5 pop



Annual TB report 2024
PHWR 2025;18

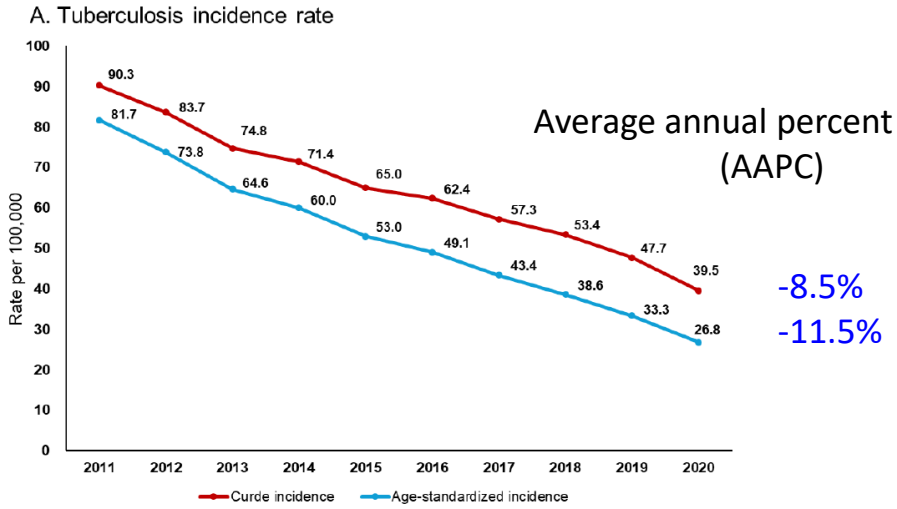
The Impact of Population Aging on Tuberculosis Incidence and Case Fatality

❖ K-TB-N cohort, registered in 2011-2020, Drug-susceptible TB , N=328,637

❖ Trends in age-specific incidence, mortality, case fatality rate during the treatment

- Crude TB incidence , mortality : the number of reported cases and deaths /the mid-year population expressed per 100,000 individuals
- Age-standardized TB incidence and mortality :direct standardization, with South Korea's 2005 population
- The case fatality rate :the percentage of all-cause deaths during the treatment period among all reported TB cases in the same year
- Age-specific TB incidence, mortality, CFR : 0–24, 25–44, 45–64, 65–79, and ≥80 years

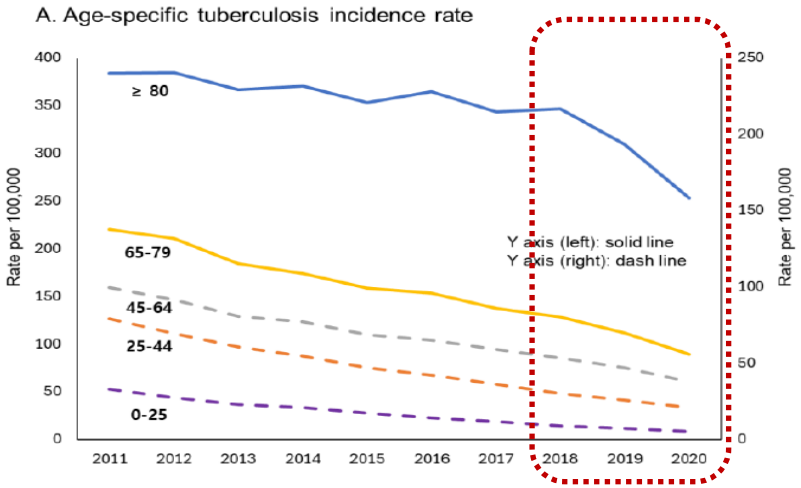
Incidence



Average annual percent change (AAPC)

-8.5%

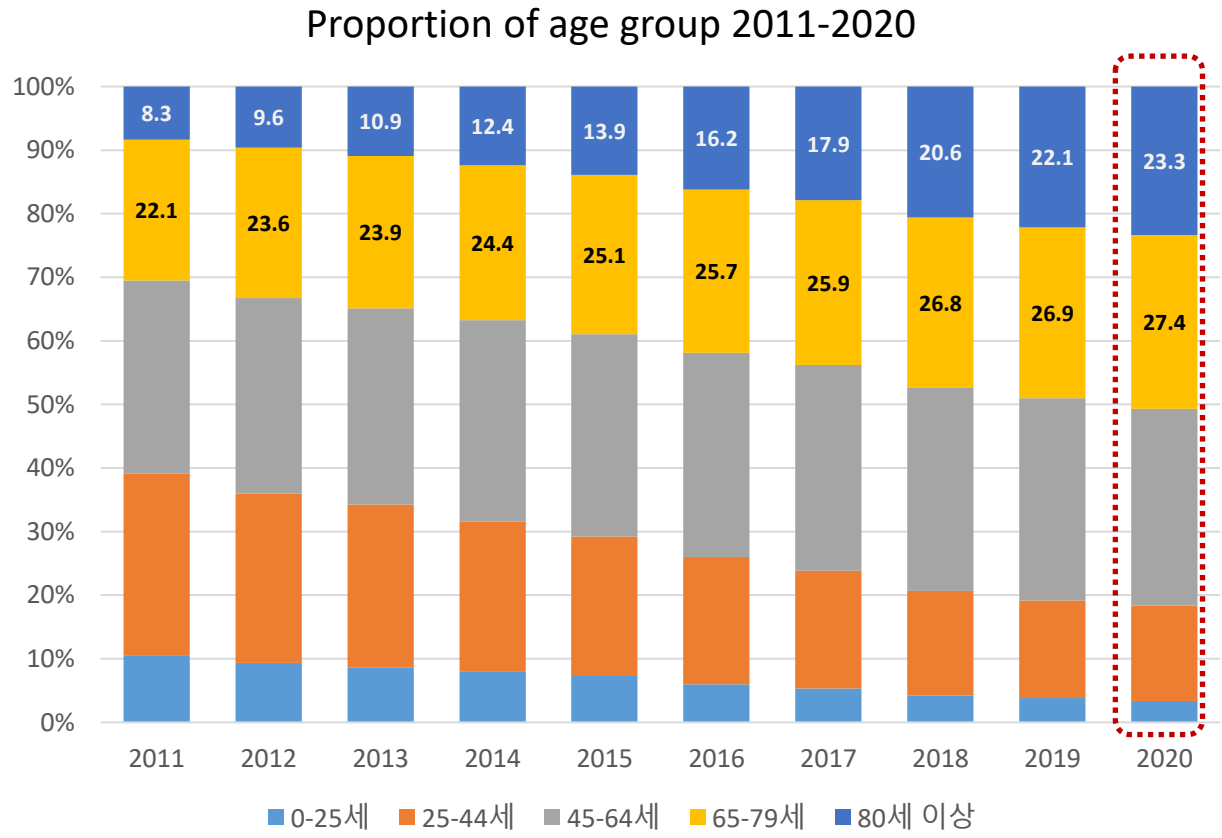
-11.5%



-4.3%

-9.3%

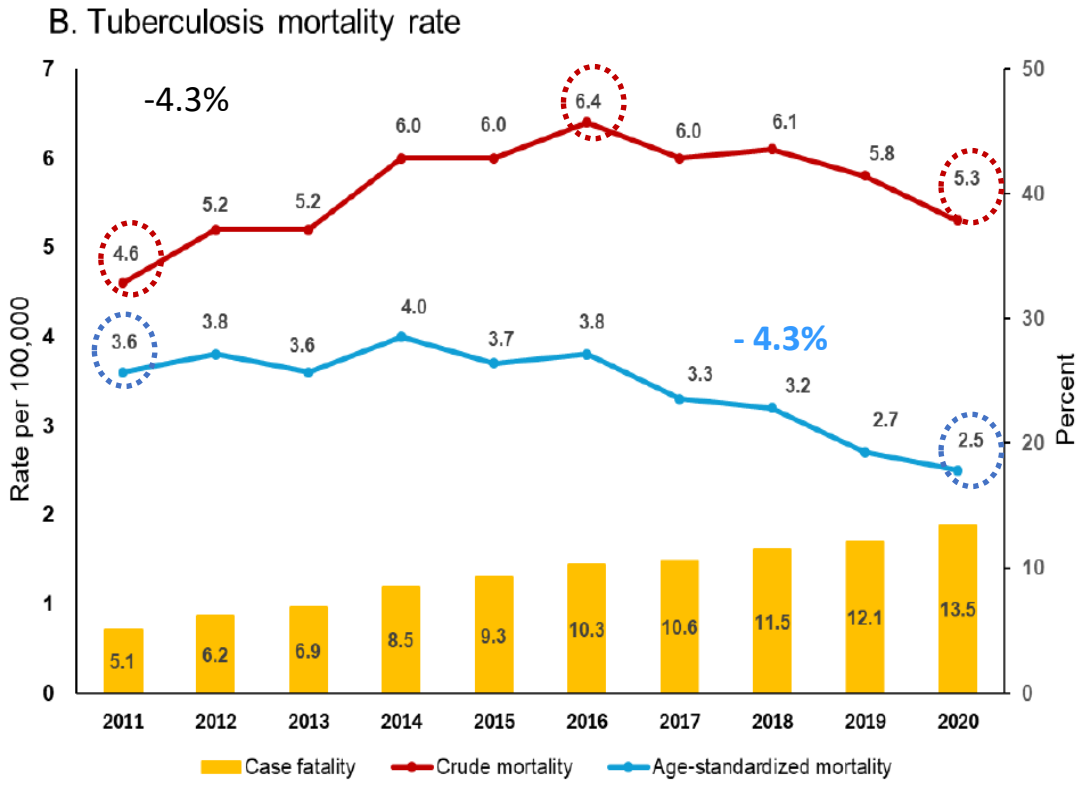
-17.4%



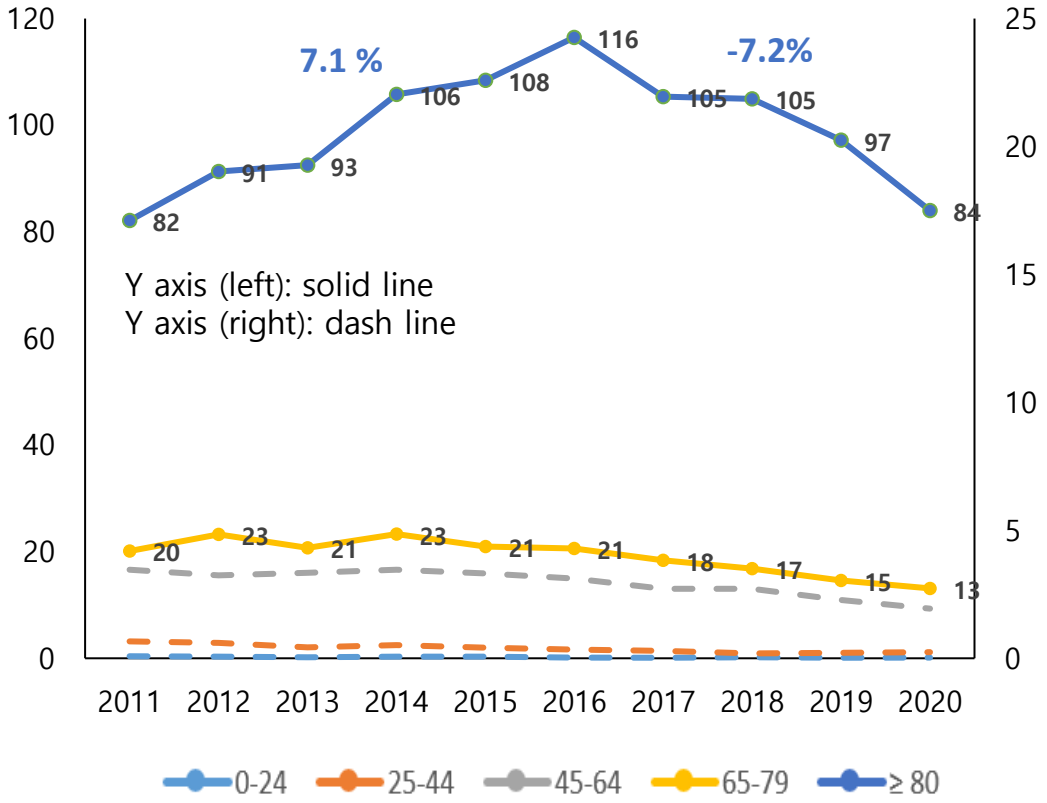
AAPC : 65-79 yo : 2.4%, 80+ : 12.1%

ERJ Open Research 2025 00191

Mortality



Age-specific tuberculosis mortality rate , /10^5



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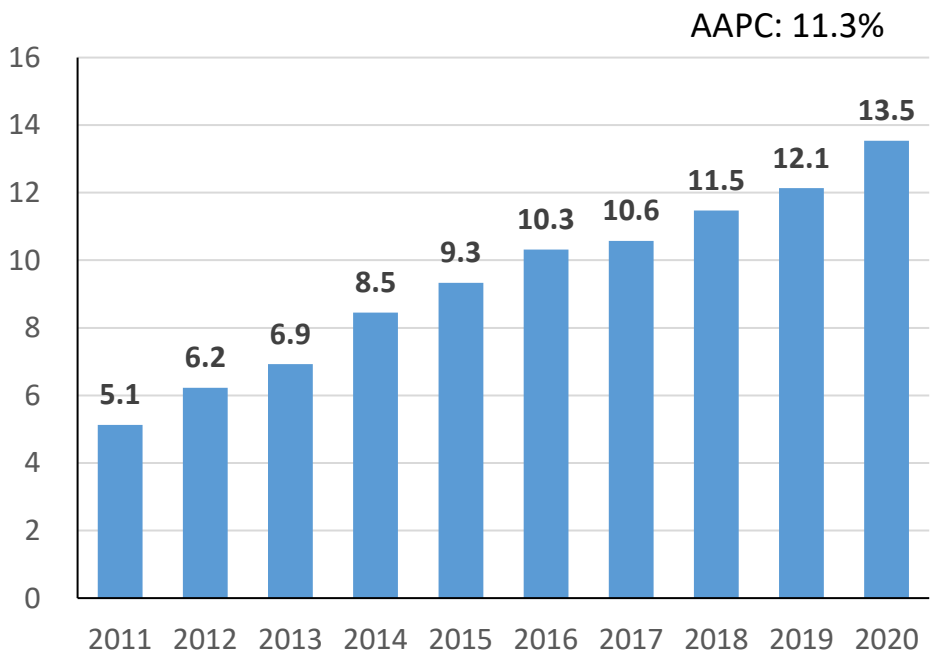
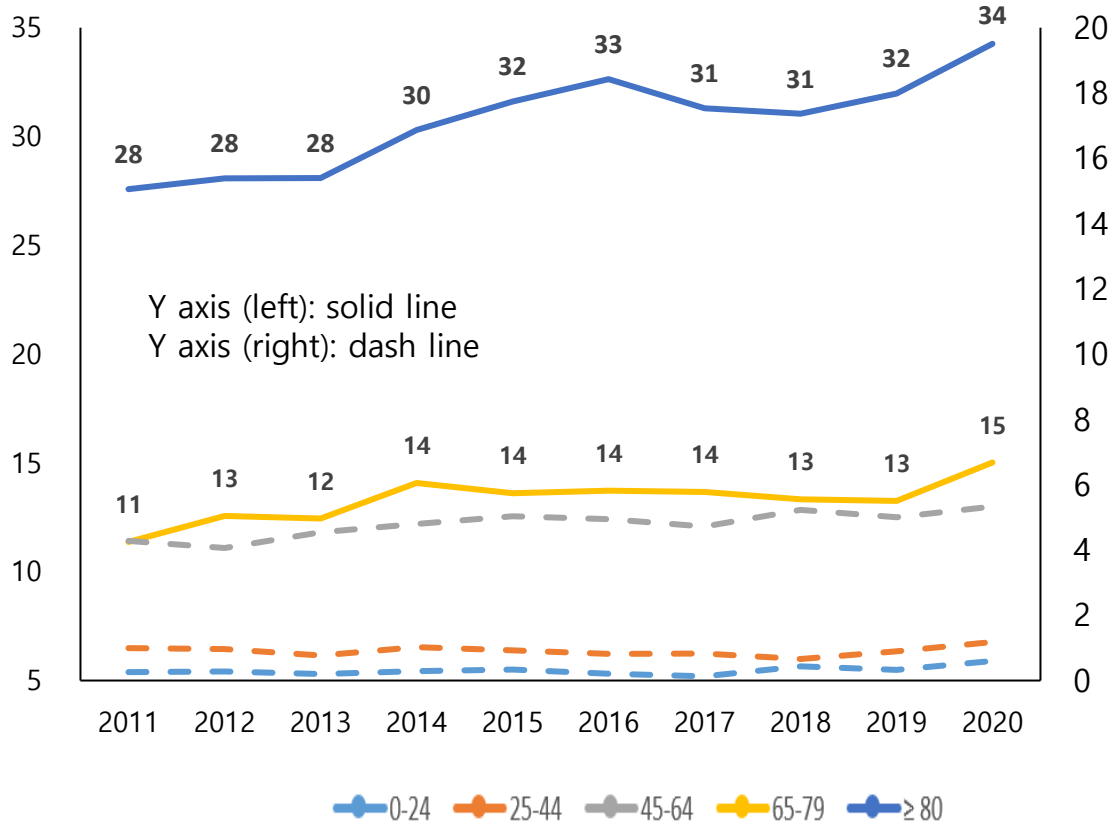
Case fatality rate

Case fatality rate 2011-2020, %



Age-specific case fatality rate, %



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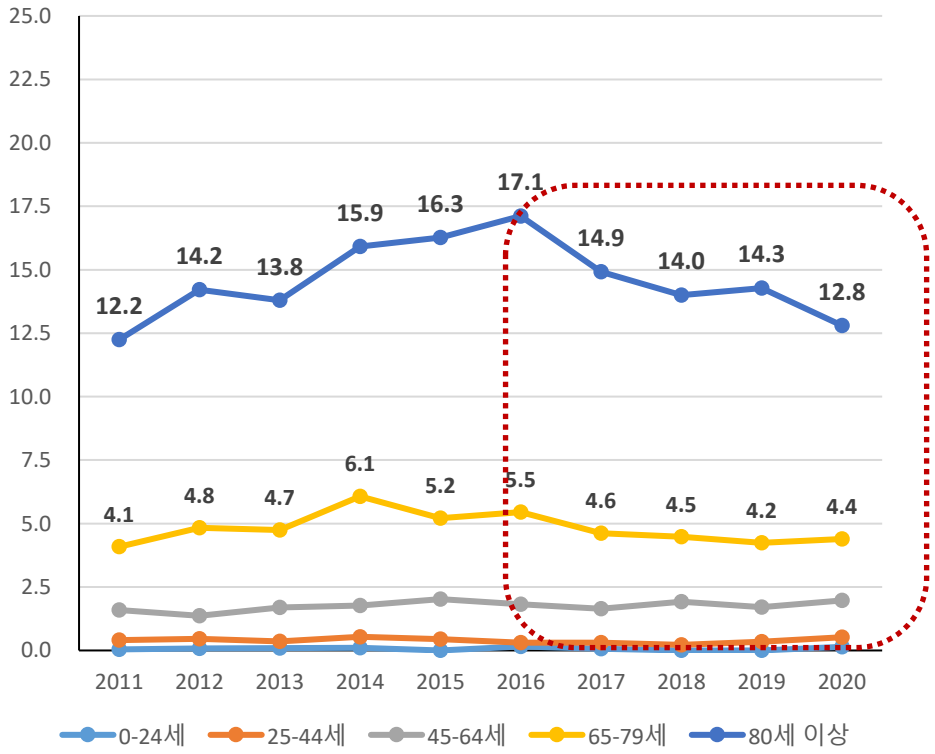
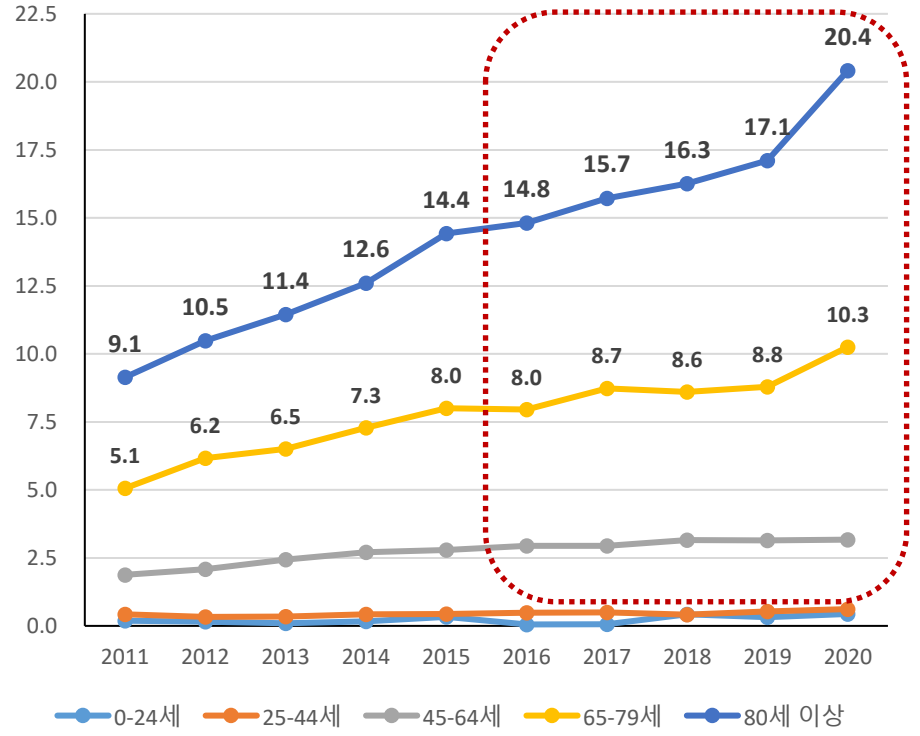
Case fatality rate

Age-specific case fatality rate (TB-related, %)



Age-specific case fatality rate (non-TB related, %)



AAPC: 8.4%

AAPC: 7.2%

ERJ Open Research 2025 00191

The Impact of Population Aging on Tuberculosis in South Korea

- The proportion of patients aged ≥65 years increased from 30.5% in 2011 to 50.7% in 2020.
- The proportion of patients aged ≥80 years increased from 8.3% in 2011 to 23.3% in 2020.
- TB incidence have decreased across all age groups, the decline has been slower among older patients, particularly those aged ≥80 years.
- This aging trend in the TB population is responsible for increase in treatment-phase case fatality rate.
- Non-TB related case fatality continued to increase among older patients, particularly those aged ≥80 years.

The proportion of H and R resistance in Korea

Table 1 Prevalence of anti-tuberculosis drug resistance among new smear-positive patients in Korea, 1994–2004

	1994*			1999			2003			2004			Resistance trend *P* value†
	n	%	95%CI	*n*	%	95%CI	*n*	%	95%CI	*n*	%	95%CI	
Total tested	2486			2370			1348			2636			
All susceptible	2204	88.70	87.4–89.9	2112	89.10	87.9–90.4	1176	87.20	85.5–89.0	2298	87.18	85.9–88.5	0.03779
Any resistance	282	11.30	10.1–12.6	258	10.90	9.6–12.1	172	12.80	11.0–14.5	338	12.82	11.5–14.1	0.03779
Resistant to													
INH+	192	7.70	6.7–8.8	204	8.60	7.5–9.7	134	9.90	8.3–11.5	261	9.90	8.8–11.0	0.00313
RMP+	55	2.20	1.6–2.8	70	3.00	2.3–3.6	43	3.20	2.3–4.1	98	3.72	3.0–4.4	0.00176

Table 2 Prevalence of anti-tuberculosis drug resistance among patients with history of previous treatment in Korea, 1994 to 2004

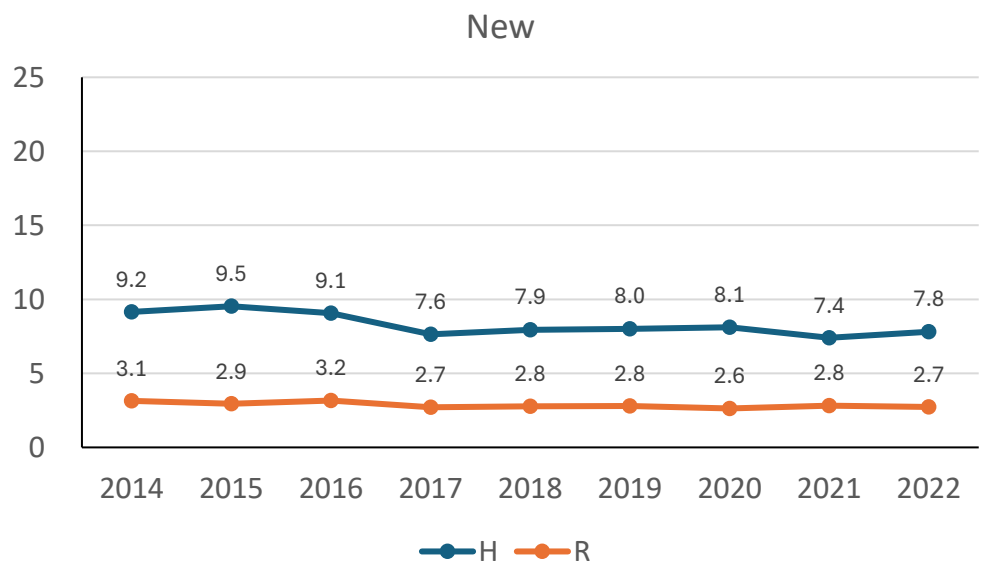
	1994*			1999			2003			2004			Resistance trend *P* value†
	n	%	95%CI	*n*	%	95%CI	*n*	%	95%CI	*n*	%	95%CI	
Total tested	189			283			622			278			
All susceptible	87	45.00	39.9–53.1	220	77.70	72.9–82.6	442	71.10	67.5–74.6	201	72.30	67.0–77.6	0.00001
Any resistance	102	54.00	46.9–61.1	63	22.30	17.4–27.1	180	28.90	25.4–32.5	77	27.70	22.4–33.0	0.00001
Resistance to													
INH+	86	45.50	38.4–52.6	49	17.30	12.9–21.7	154	24.80	21.4–28.2	67	24.10	19.1–29.1	0.00034
RMP+	61	32.30	25.6–38.9	29	10.20	6.7–13.8	98	15.80	12.9–18.6	47	16.910	12.5–21.3	0.00340

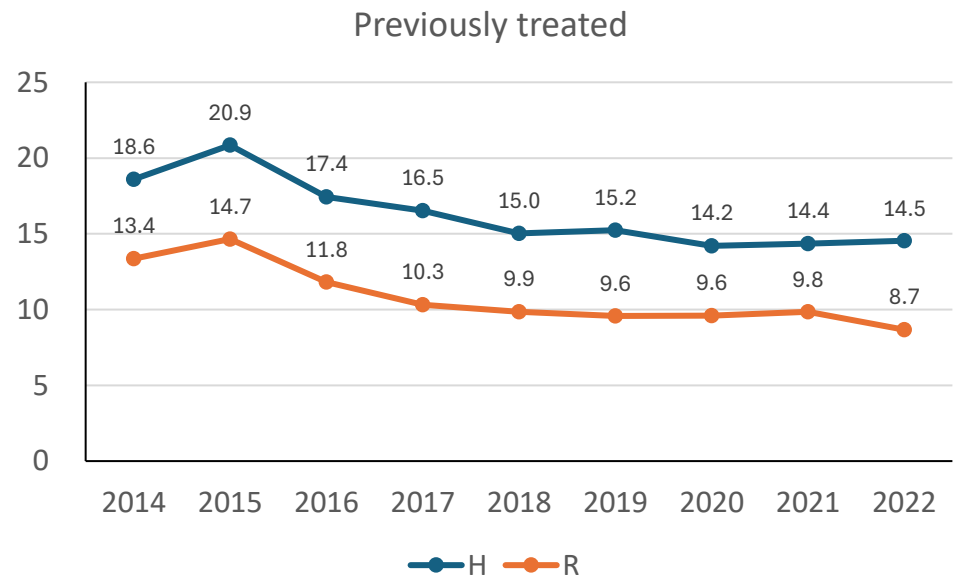
IJTLD 2007;11:571

The proportion of H and R resistance in Korea

❖ K-TB-N cohort : 262,867 episode (2014-2022), DST performed 136,495 episode

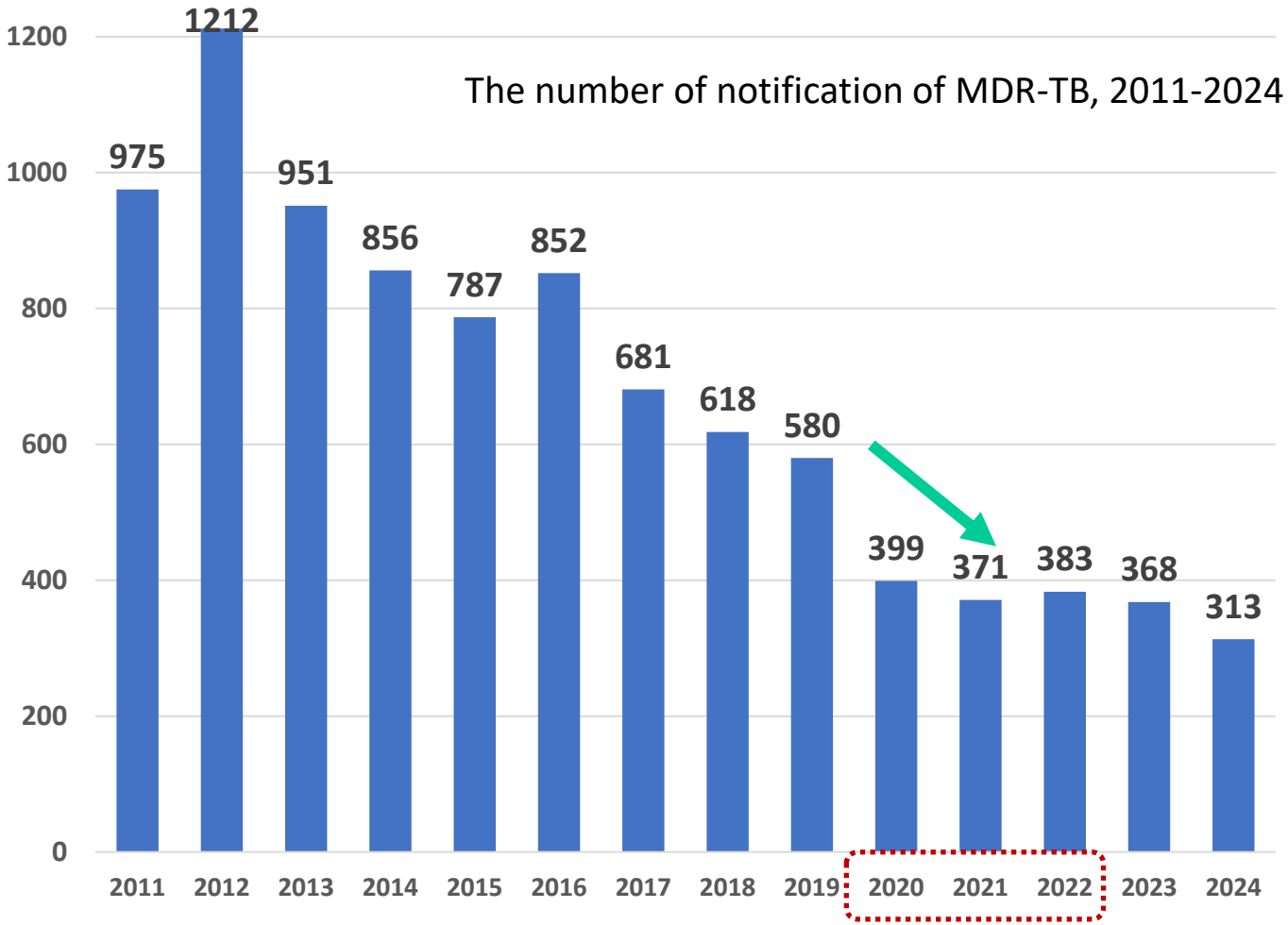
- mDST/Xpert/pDST
- New episode (n=117,947), previously treated episode (n=16,845)

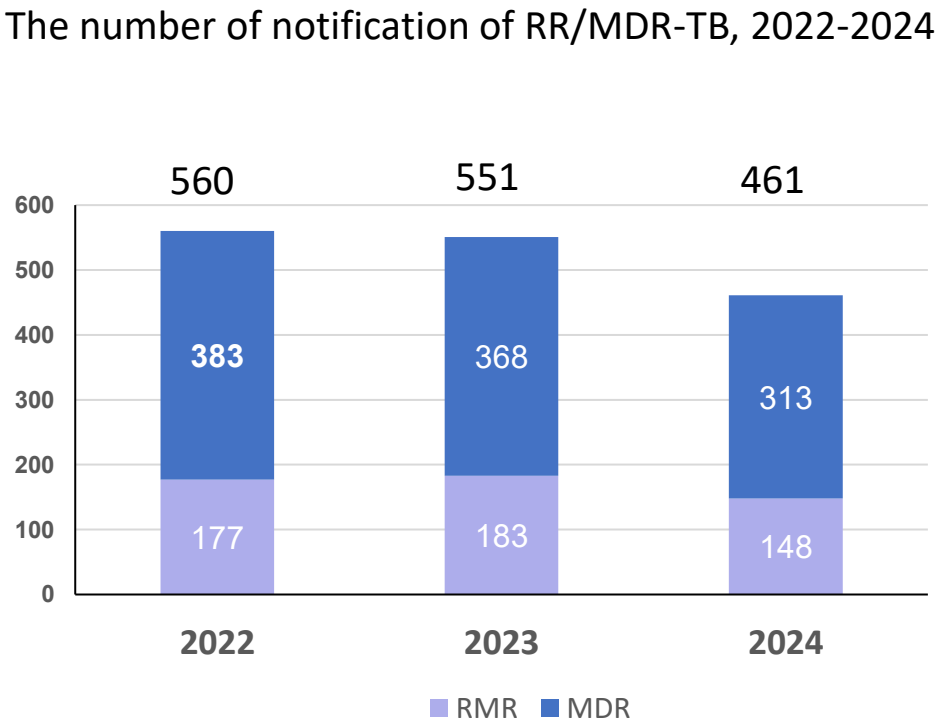




Unpublished data

MDR-TB notification in Korea





Clinical characteristics of MDR-TB patients

- Korean TB cohort within PPM project, 2018-2021
- MDR-TB patients
  - Younger than pan-susceptible TB patients
  - Lower BMI
  - More foreigners
  - More previous treatment history, but considerable new patients

Characteristic	MDR/RR-TB (n=502)	Pan-susceptible TB (n=10,656)
Sex		
Male	322 (64.1)	6,573 (61.7)
Female	180 (35.9)	4,083 (38.3)
Age, yr		
<45	142 (28.3)	1,953 (18.3)
45–64	177 (35.3)	3,455 (32.4)
≥65	183 (36.5)	5,248 (49.2)
Body mass index <18.5 kg/m^2	109 (21.7)	1,951 (18.3)
Ever smoker	230 (45.8)	4,469 (41.9)
Diabetes	94 (18.7)	2,407 (22.6)
Foreigner	60 (12.0)	386 (3.6)
Prior history of anti-TB treatment	145 (28.9)	1,251 (11.7)
Pulmonary TB	447 (89.0)	9,576 (89.9)
Cavitation on chest X-ray	84 (16.7)	1,519 (14.3)
Bilateral involvement on chest X-ray	153 (30.5)	3,031 (28.4)
Presence of TB symptoms	344 (68.5)	7,411 (69.5)
Calendar year		
2018	145 (28.9)	1,627 (15.3)
2019	162 (32.3)	3,312 (31.1)
2020	97 (19.3)	2,911 (27.3)
2021	98 (19.5)	2,806 (26.3)

TRD 2025;88:159

Treatment outcomes of MDR-TB in Korea

- MDR/RR-TB cases notified in 2011-2017, N=7,226
- Increase of treatment success, decrease of LTFU, NE and failure
- Increase of death and stagnant of treatment success since 2015

Variables	2011 (n = 1,340)	2012 (n = 989)	2013 (n = 1,025)	2014 (n = 1,119)	2015 (n = 986)	2016 (n = 965)	2017 (n = 802)	Total (n = 7,226)	*P* for trend
Treatment success	856 (63.9)	698 (70.6)	791 (77.2)	869 (77.7)	758 (76.9)	734 (76.1)	602 (75.1)	5,308 (73.5)	< 0.001
Treatment failed	42 (3.1)	35 (3.5)	19 (1.9)	18 (1.6)	10 (1.0)	8 (0.8)	4 (0.5)	136 (1.9)	< 0.001
Lost to follow-up	190 (14.2)	123 (12.4)	99 (9.7)	97 (8.7)	84 (8.5)	80 (8.3)	57 (7.1)	730 (10.1)	< 0.001
Not evaluated	159 (11.9)	71 (7.2)	28 (2.7)	27 (2.4)	18 (1.8)	26 (2.7)	24 (3.0)	353 (4.9)	< 0.001
Died	93 (6.9)	62 (6.2)	88 (8.6)	108 (9.6)	116 (11.8)	117 (12.1)	117 (14.3)	996 (9.7)	< 0.001
TB-related	50 (3.7)	23 (2.3)	39 (3.8)	35 (3.1)	40 (4.1)	39 (4.0)	26 (3.2)	252 (3.5)	0.513
Non-TB-related	43 (3.2)	39 (3.9)	49 (4.8)	73 (6.5)	76 (7.7)	78 (8.1)	89 (11.1)	447 (6.2)	< 0.001

JKMS 2023;38:e33

Impact of mDST on the time to treatment initiation

- National TB Expert Review Committee for novel drugs
- 621 MDR/RR-TB patients : 2016.9.1 ~ 2019.12.30

Table 2. Coverage rate of mDST among patients with multidrug/rifampin-resistant tuberculosis

Variables	2015	2016	2017	2018	2019	Total
mDST*	7 (70.0)	38 (50.7)	121 (68.0)	149 (75.3)	127 (79.4)	442 (71.2)
Xpert	2 (20.0)	8 (10.7)	28 (15.7)	42 (21.2)	29 (18.1)	109 (17.6)
LPA	3 (30.0)	19 (25.3)	54 (30.3)	68 (34.3)	55 (34.4)	199 (32.0)
Both	2 (20.0)	11 (14.7)	39 (21.9)	39 (19.7)	43 (26.9)	134 (21.6)
None	3 (30.0)	37 (49.3)	57 (32.0)	49 (24.7)	33 (20.6)	179 (28.8)
Total	10	75	178	198	160	621

Table 5. Time to MDR-TB treatment initiation by diagnostic method

Variables	Xpert (n = 156)	LPA (n = 202)	pDST (n = 263)	Total (n = 621)	*P* value[a]
Time to MDR-TB treatment initiation	0 (0)	22.0 (11.0, 43.0)	72.0 (57.0, 100.0)	35.0 (0, 2.0)	< 0.001
Time to MDR-TB diagnosis	−1.0 (−3.0, 0)	15.0 (6.0, 35.0)	58.0 (43.0, 78.0)	26.0 (0, 58.0)	< 0.001
Treatment delay	2.0 (1.0, 5.8)	5.0 (2.0, 9.3)	13.0 (5.0, 25.0)	6.0 (2.0, 14.0)	< 0.001

JKMS 2020;35:e284

RR/MDR-TB status in Korea

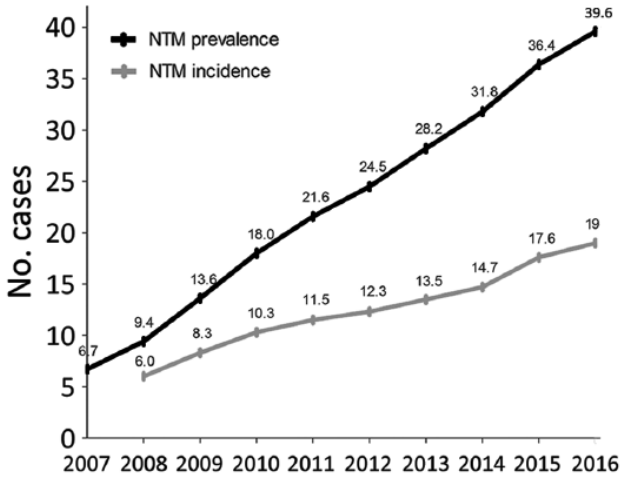
- Korea still carries a burden of RR/MDR-TB : younger than DS-TB (transmission), foreigner.
- Find fast, treat early: Rapid diagnosis and prompt treatment are essential for infection control.
- Diagnostics coverage: Expand Xpert & mDST (95-96% in 2021).
- Trace transmission: Apply WGS for surveillance and cluster control
- Integrated care : Use new all oral shorter regimens and ensure integrated care for older adults with comorbidities.

NTM epidemiology in Korea

- NTM infection incidence, prevalence and mortality
- Clinical phenotype and species distribution

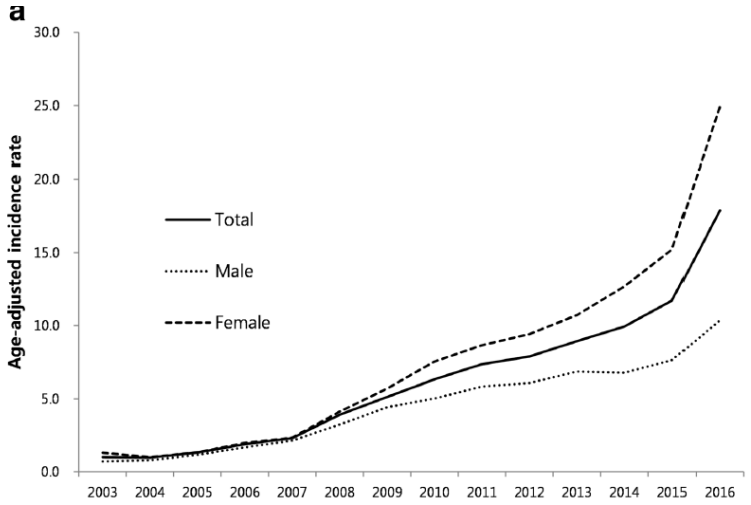
Incidence and prevalence of NTM infection in Korea

ICD-10 code + AFB sm or culture code



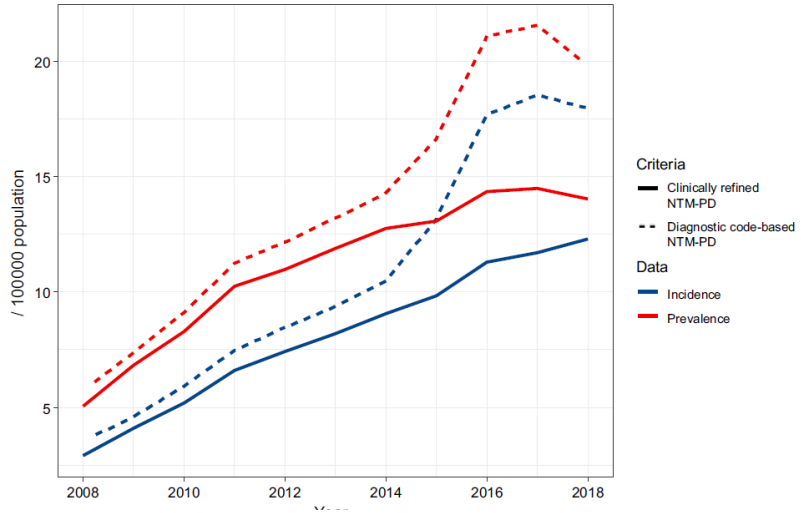
2016
Incidence : 19/ 10^5 pop
Prevalence : 39.6 / 10^5 pop

ICD-10 code as primary diagnosis



2016
Incidence : 17.9/ 10^5 pop
Prevalence : 33.3 / 10^5 pop

ICD-10 code twice + excluding low AFB culture rate institution

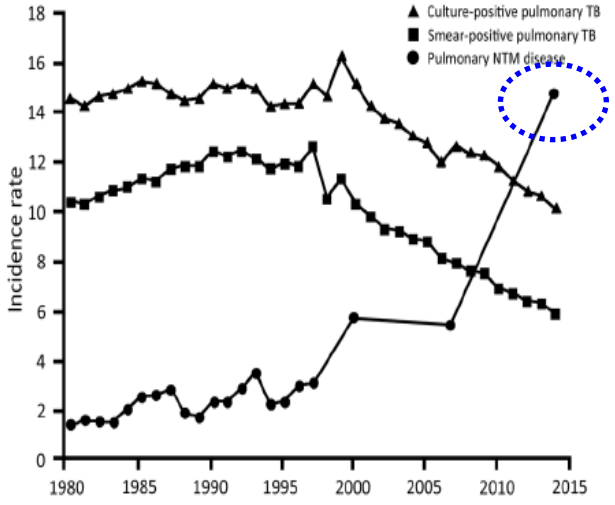


2016
Incidence, Code : 17.7/ 10^5 pop
Incidence, refined : 11.3 / 10^5 pop

Em infe Dis 2019;25:569, BMC pul med 2019;19:140, BMC pul med 2022;22:195

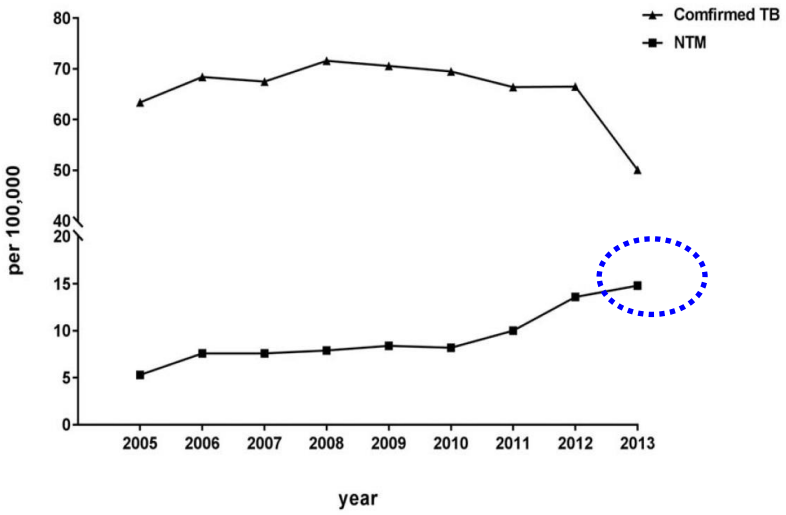
NTM incidence in Asia and North America

Japan, Survey-based



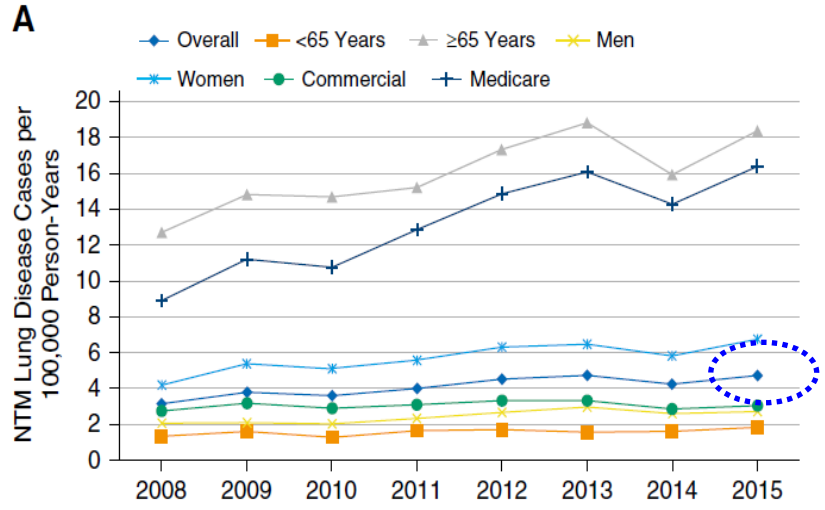
Incidence : 14.7/10^5 pop in 2014

Tiwan, NHID ICD-10 and treated drugs



Incidence : 14.8/10^5 pop in 2013

USA, national managed care claims database, ICD-10



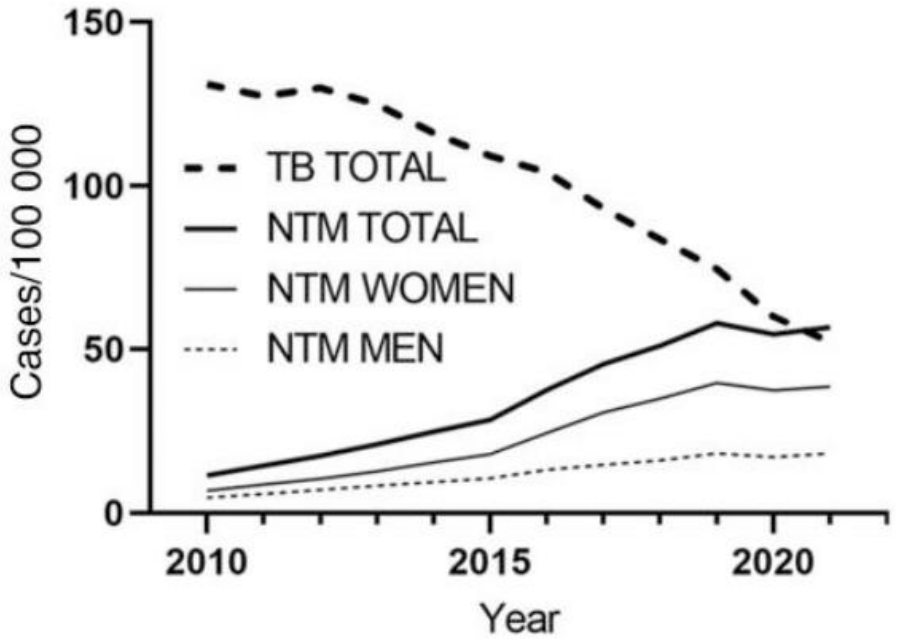
Incidence : 4.73/10^5 pop in 2015

Em infe Dis 2016;22:1116, Medicine 2020;99:52, Ann Am Thorac Soc 2020;17:178

2022 Dec 1;9(12):ofac649

Increasing NTM , decreasing TB in Korea

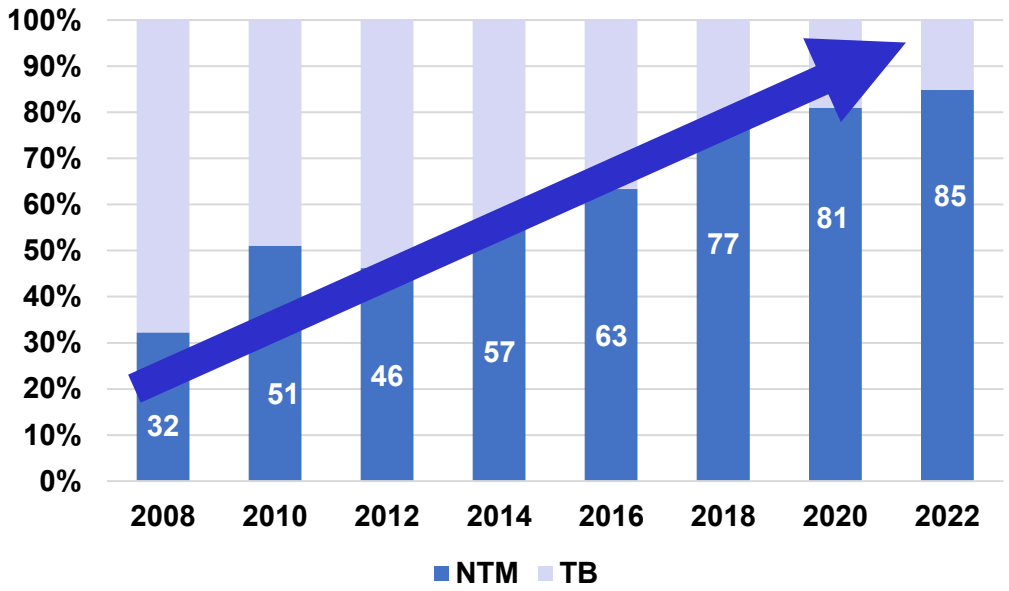
NHIS, ICD-10 code, primary diagnosis



Annual crude prevalence 56.7/10^5 in 2021

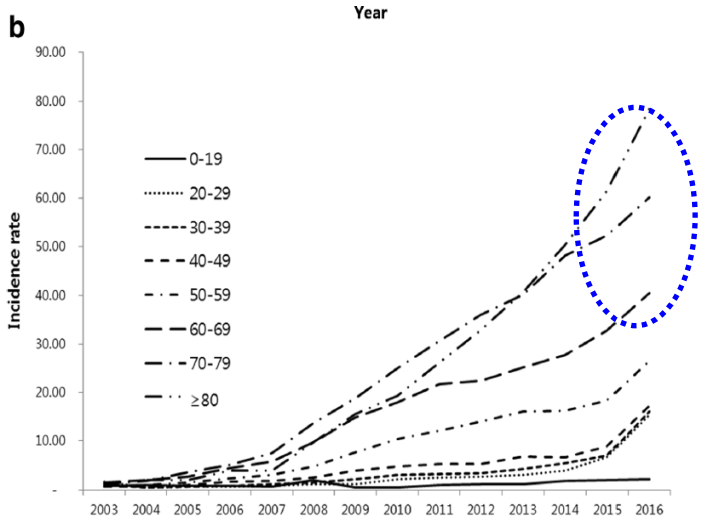
TB prevalence 52.1/10^5 in 2021

Proportion of positive mycobacterial culture in Severance

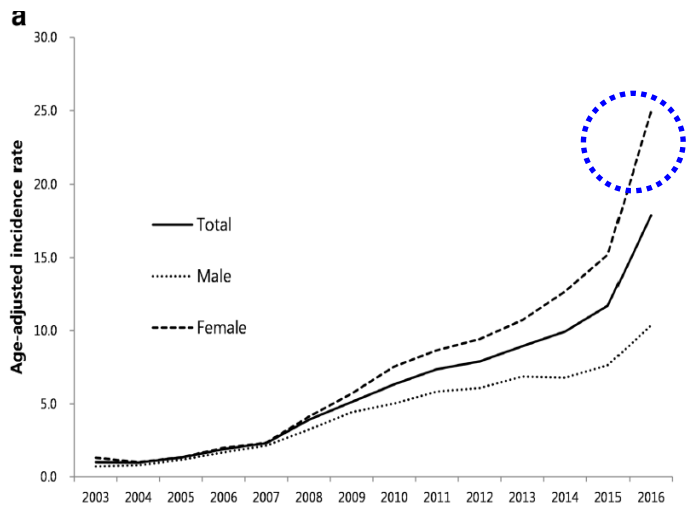


85% of positive cultures = NTM

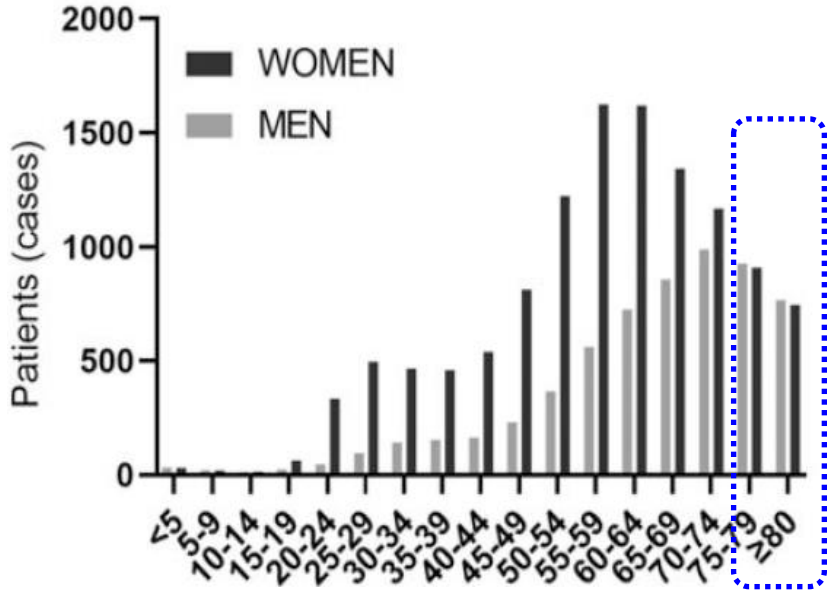
Age-Sex distribution among NTM patients in Korea



Predominance in older adults (≥60 years)



Female predominance overall

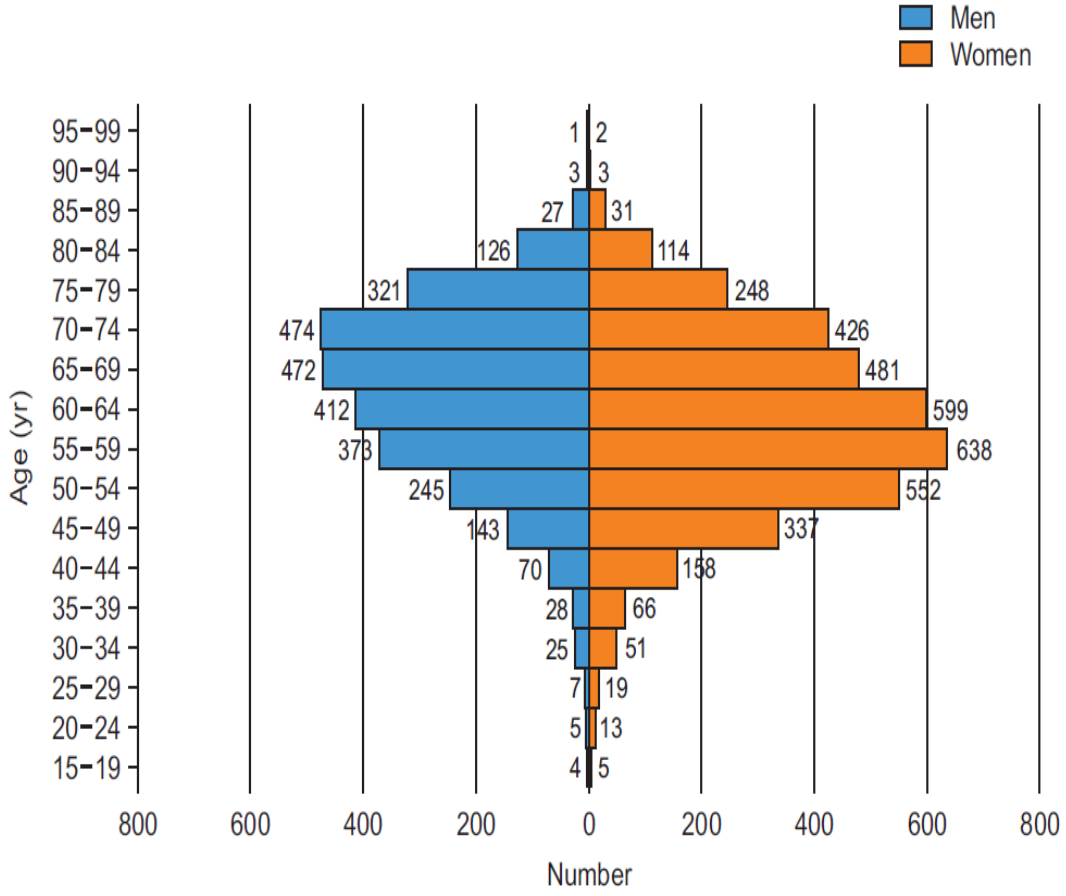


Male predominance in the very elderly (≥75 years)

BMC pul med 2019;19:140, OFID 2022;9)ofac649

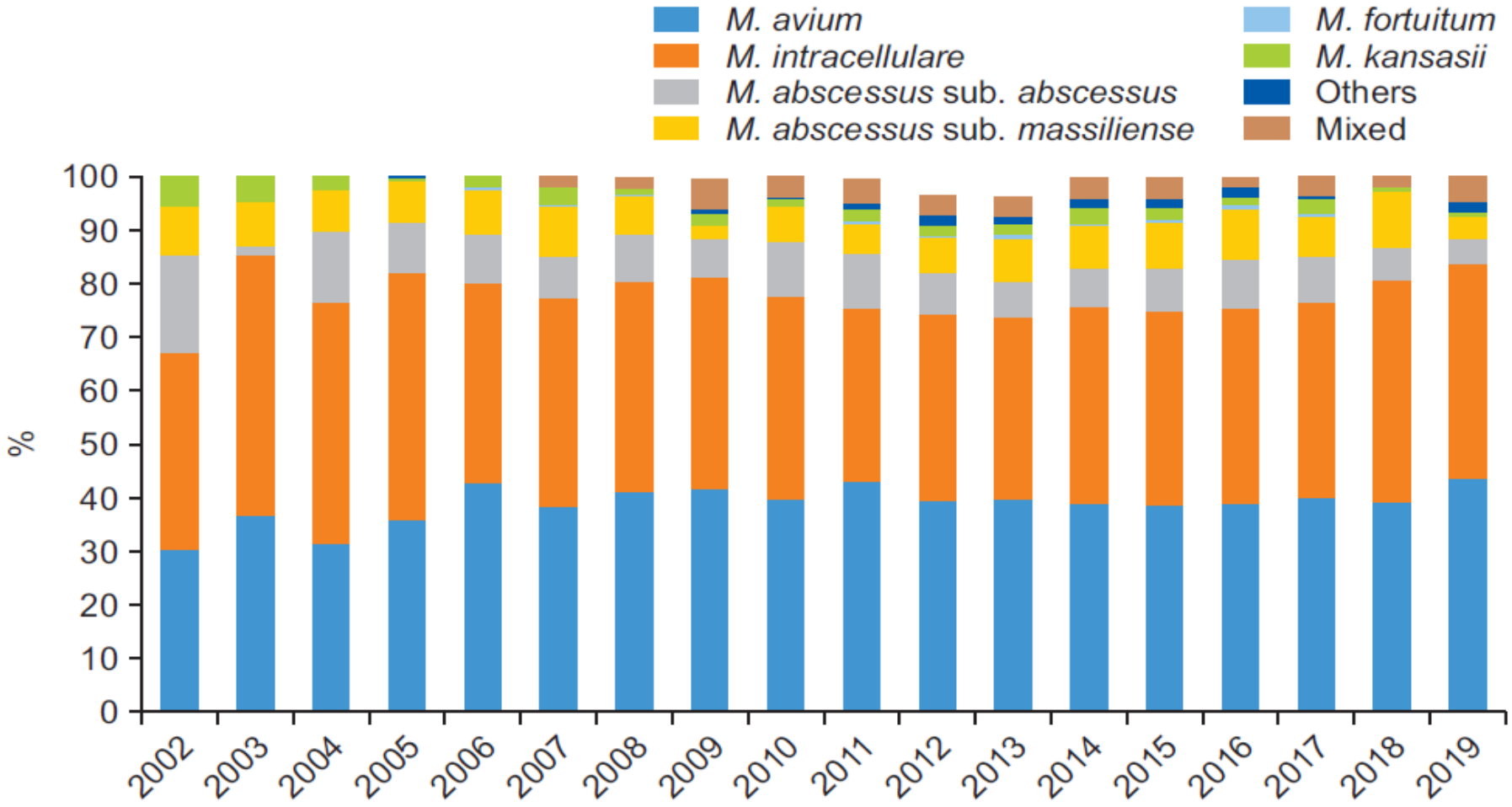
Clinical characteristics NTM-PD, IPD in Korea

- 6,489 patients with NTM-PD
- 18 published articles (11 institutes) ~ 2022
- Men were diagnosed with NTM-PD at an older age than women
  - Mean age 63.8±11.8 vs 59.9±11.6
- More male patients in elderly (≥70 years)
  - N=949 vs N=824



Tuberc Respir Dis 2024;87:386

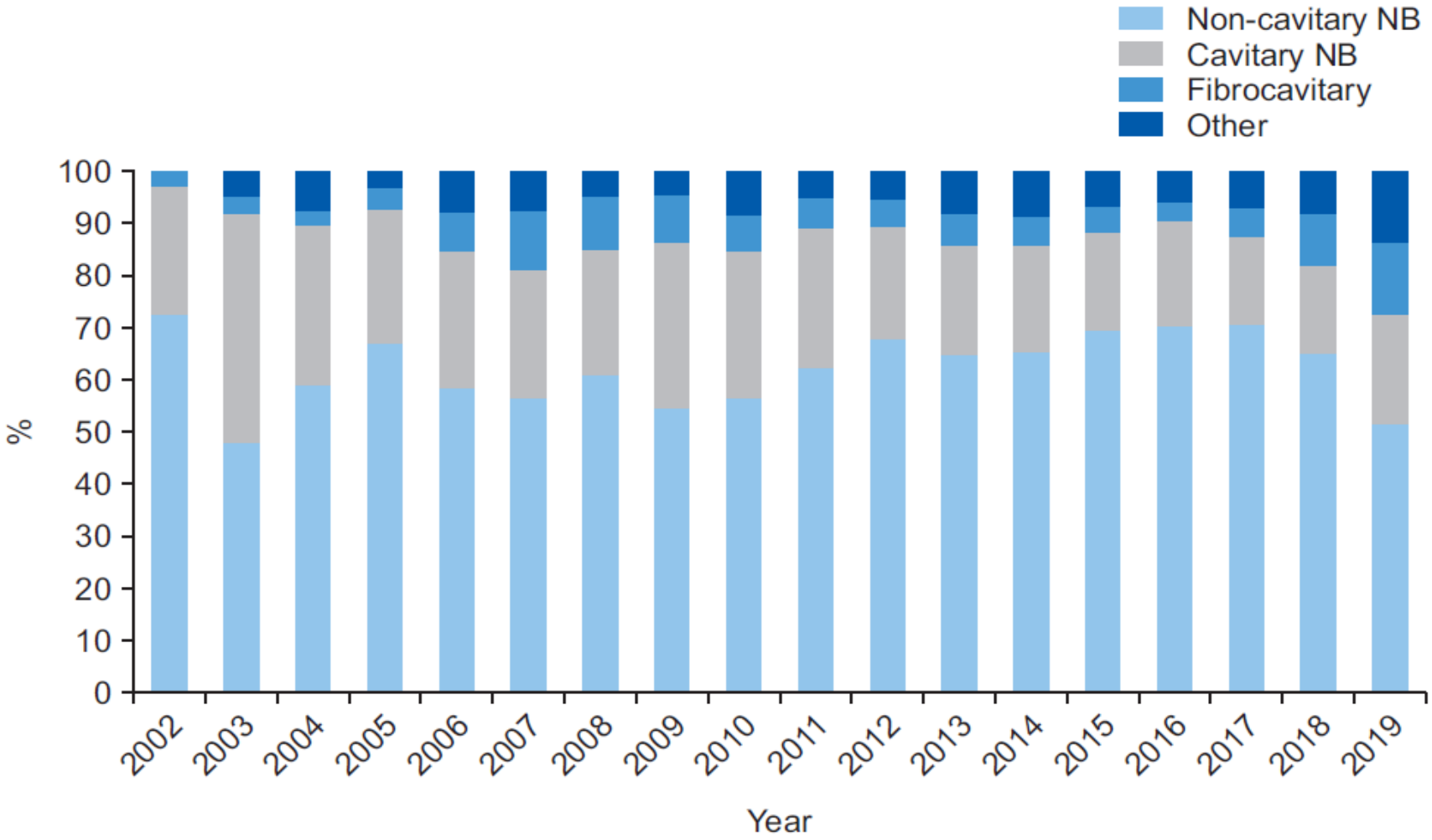
Species distribution



- *M.avium 41.4%*
- *M.Intracellulaure 38.4%*
- *M.abscessus 8.6%*
- *M.massiliense 7.8%*
- *M.kansasii 2.1%*

Tuberc Respir Dis 2024;87:386

Radiologic phenotype

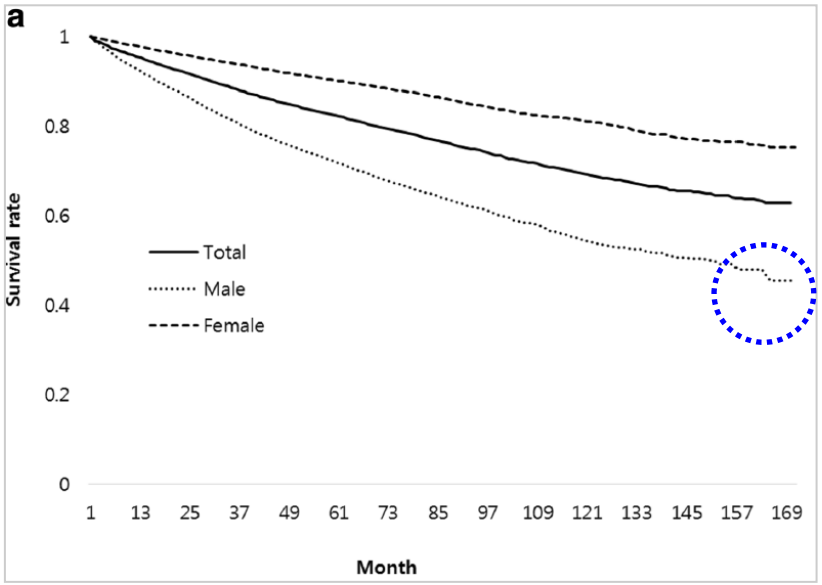


- *Fibrocavitary 6.5%*
- *Cavitary NB 22.0%*
- *Non-caviatary NB 64.5%*
- *Others 6.9%*

Tuberc Respir Dis 2024;87:386

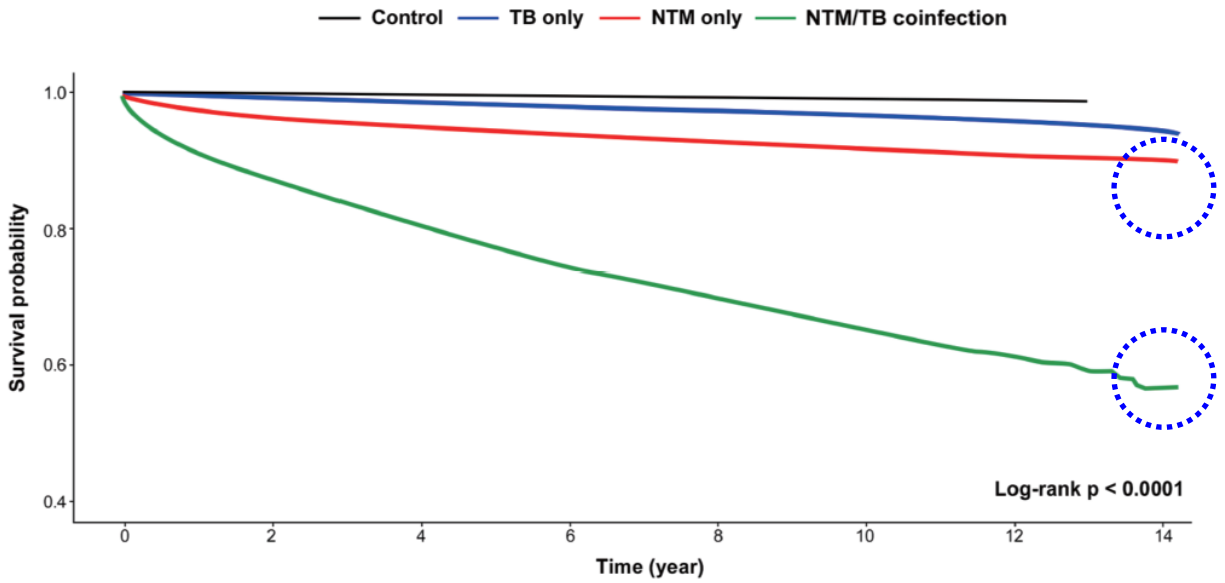
Mortality in patients with NTM

ICD-10 code, 2002-2016



All cause mortality : 4.7% at 1yr, 17.8% at 5years
Standardized Mortality Ratio : 2.16 (2.10-2.22)
Poor survival in male patients

ICD-10 code, 2002-2017



All cause mortality, NTM group: 14.7% at 6yr, 19.2 % at 10years
NTM only group : 6% at 6yr, 8.1 % at 10years
NTM-TB coinfection group : 24.9% at 6yr, 34.6 % at 10years

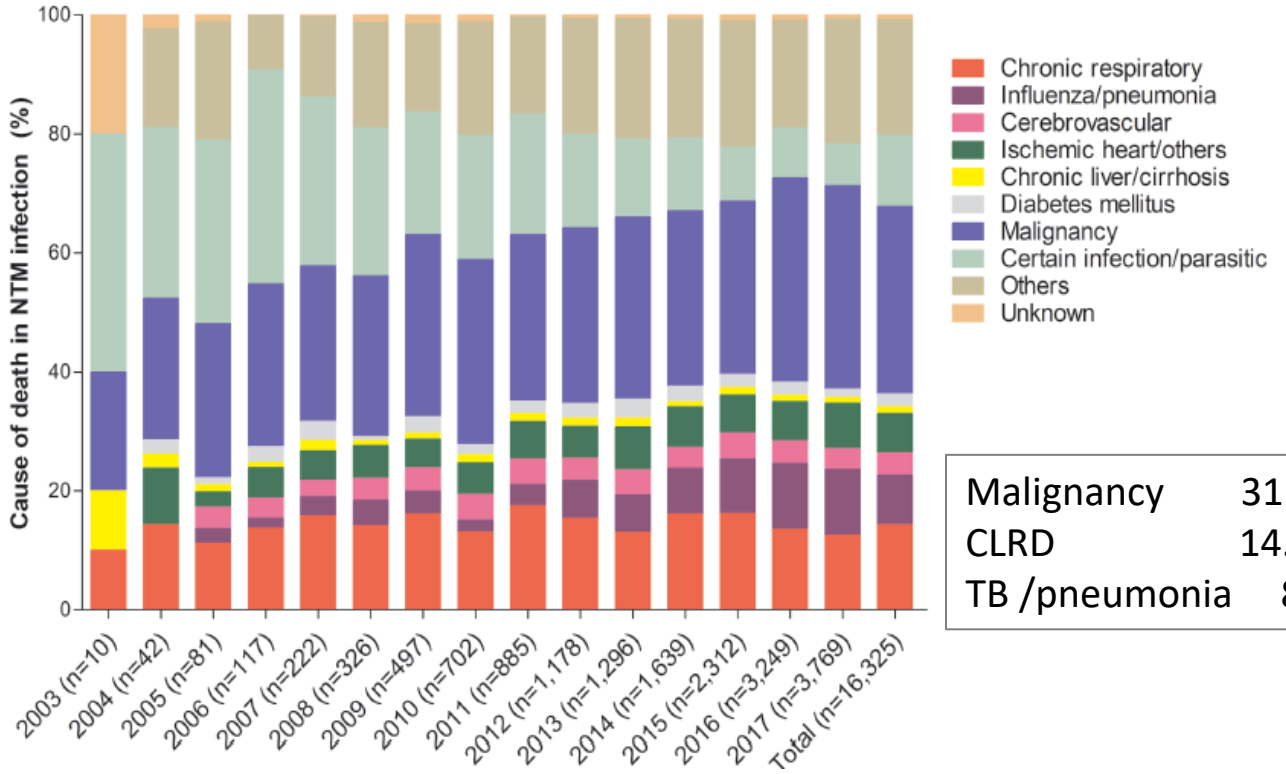
BMC pul med 2019;19:140, CID 2021;72:e610

Causes of death in NTM infection

Table 2 Cause of death in patients with NTM infection

Causes of death	Number of patients (%)
Tuberculosis	509 (10.0)
Pneumonia	424 (6.0)
CLRD	725 (8.3)
Lung cancer	369 (14.2)
Other cancers	769 (7.2)
CDVD	300 (15.0)
CBVD	155 (5.9)
DM	99 (3.0)
Hypertension	34 (1.9)
Others	1,392 (27.2)
Unknown	29 (0.6)
Total	5,112 (100.0)

Malignancy including lung cancer	21.4%
Cardiovascular disease	15.0%
TB /pneumonia/ CLRD	24.3%

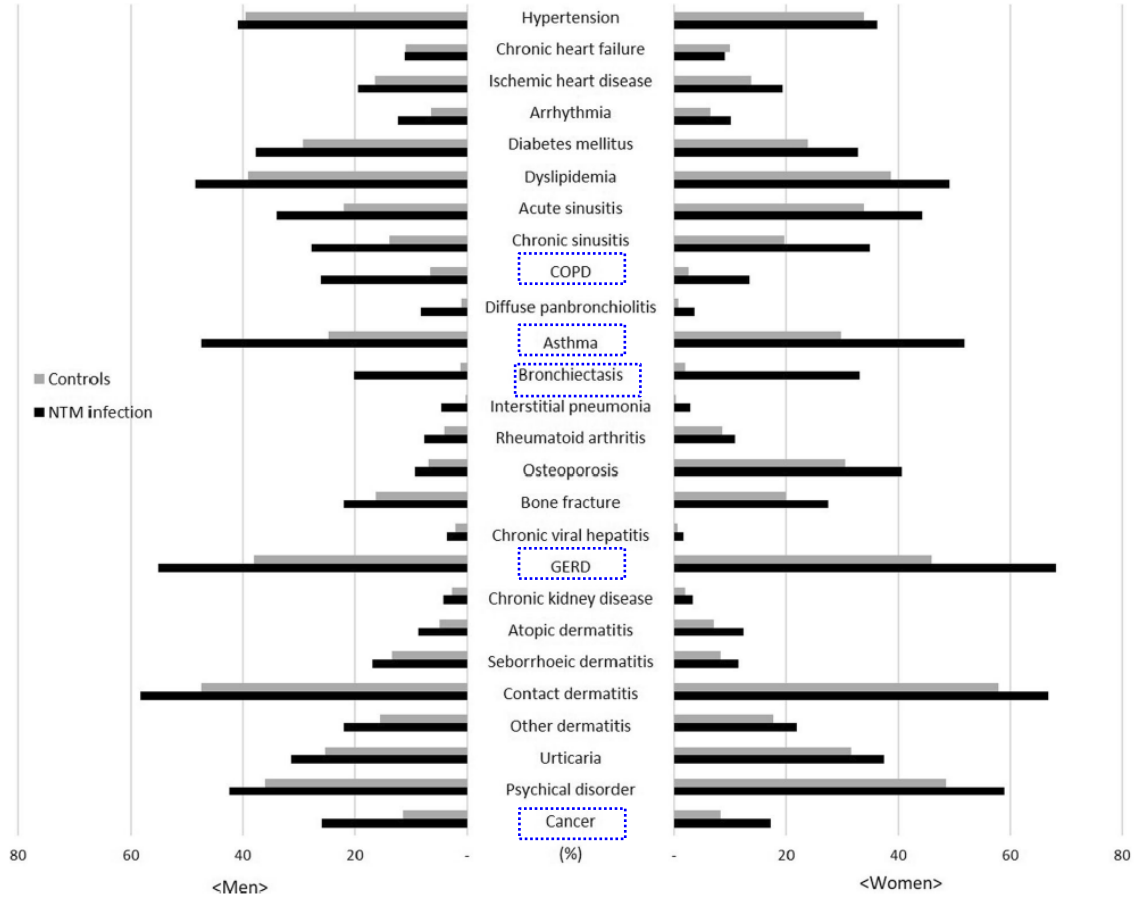


Malignancy	31.5%
CLRD	14.3%
TB /pneumonia	8.3%

BMC pul med 2019;19:140, CID 2021;72:e610

Comorbidities

- Chronic respiratory disease
  - COPD, asthma, bronchiectasis, ILD
- Malignancy
- Gastrointestinal disease
  - GERD
- Upper air ways disease
  - Sinusitis
- Liver disease
  - Chronic viral hepatitis



BMC pul med 2022;22:283

NTM epidemiology in Korea

- NTM disease has increased steadily in Korea; crude prevalence ~56–57 per 100,000 in 2021, surpassing TB.
- Predominantly affects older adults with overall female predominance; in ≥75 years, a male predominance emerges.
- Respiratory comorbidities (bronchiectasis, COPD, ILD) and malignancy comorbidities are common.
- Mortality is elevated (SMR 2.16) and higher with TB–NTM coinfection.
- Leading causes of death : chronic lower respiratory diseases, TB and pneumonia, malignancies and CVD.

Clinical implications of TB/NTM epidemiology in South Korea

- ❖ Epidemic shift : TB is declining while NTM is rising—and accelerating
  - ➢ Targeted TB control**:** support vulnerable groups (older adults, immigrants, homeless, medical-aid/low-income populations).
- ❖ Diagnosis ; TB–NTM diagnostic confusion is common
  - ➢ Old age more complicated for the diagnosis
  - ➢ Rapid molecular diagnostic test for ruling out TB (eg, Xpert)
- ❖ Prognosis ; prognosis linkage
  - ➢ Prior TB is a risk factor for future NTM; TB–NTM coinfection carries higher mortality than NTM alone.
  - ➔ Further evaluation and management for post-TB lung disease is essential.
- ❖ Comorbidity care (bidirectional)
  - ➢ Actively manage chronic comorbidities in TB/NTM
  - ➢ Ensure timely detection and effective treatment of TB/NTM in chronic disease population

Thank you for your attention!