

결핵과 장애의 양방향 연관성

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목차

- 결핵
- 장애가 결핵에 미치는 영향
- 결핵 후유증으로 인한 장애



Tuberculosis Notification Cases Trends in Korea

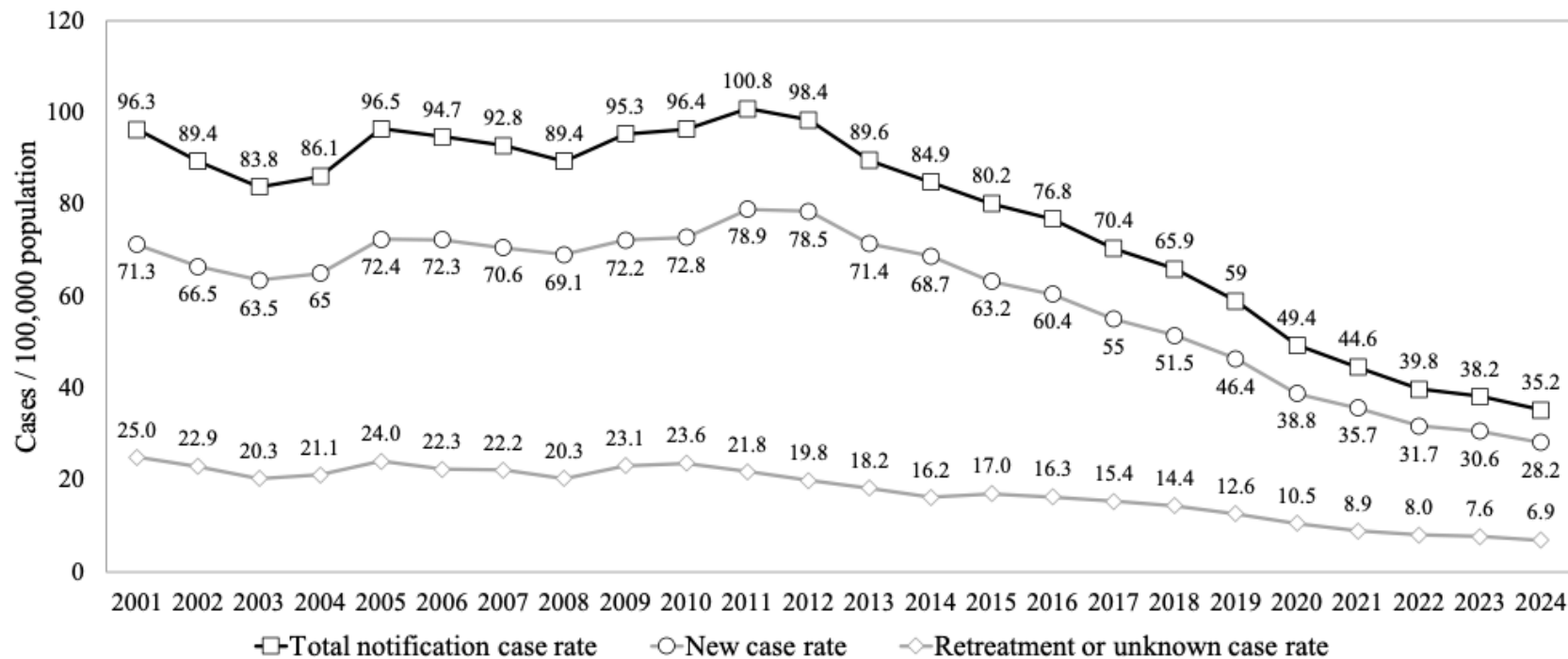
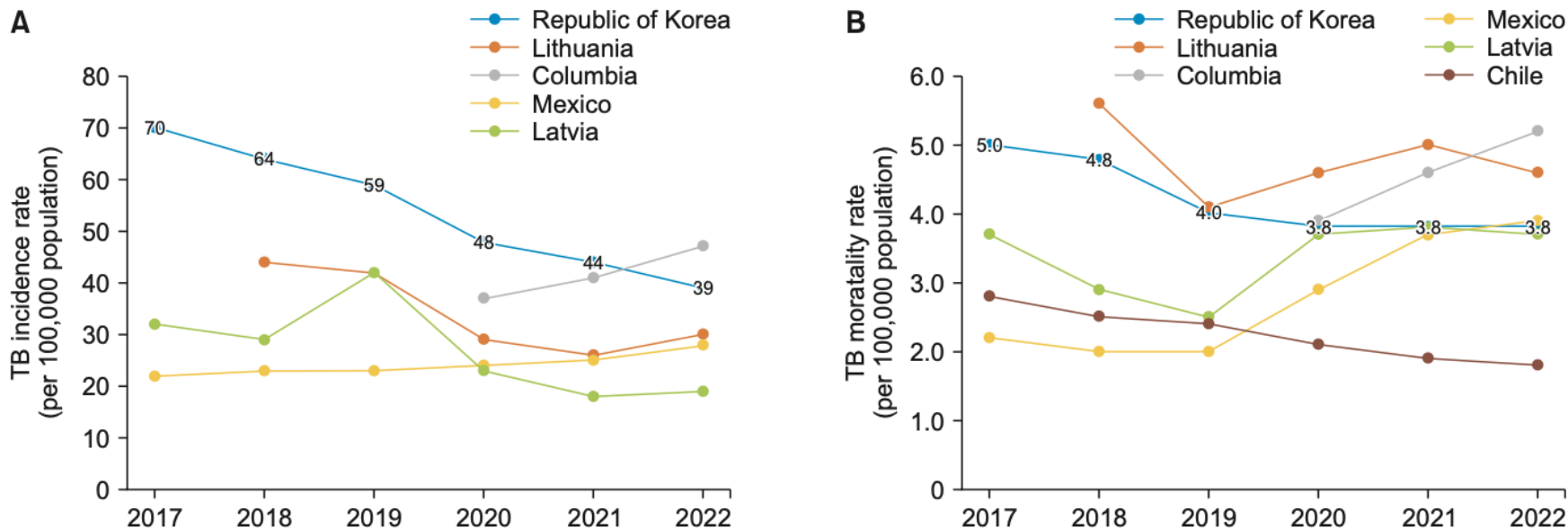


Figure 1. Estimates of tuberculosis (TB) burdens in the Republic of Korea and other member countries of the Organization for Economic Co-operation and Development countries between 2017 and 2022; (A) TB incidence rate, and (B) TB mortality rate. TB, tuberculosis.



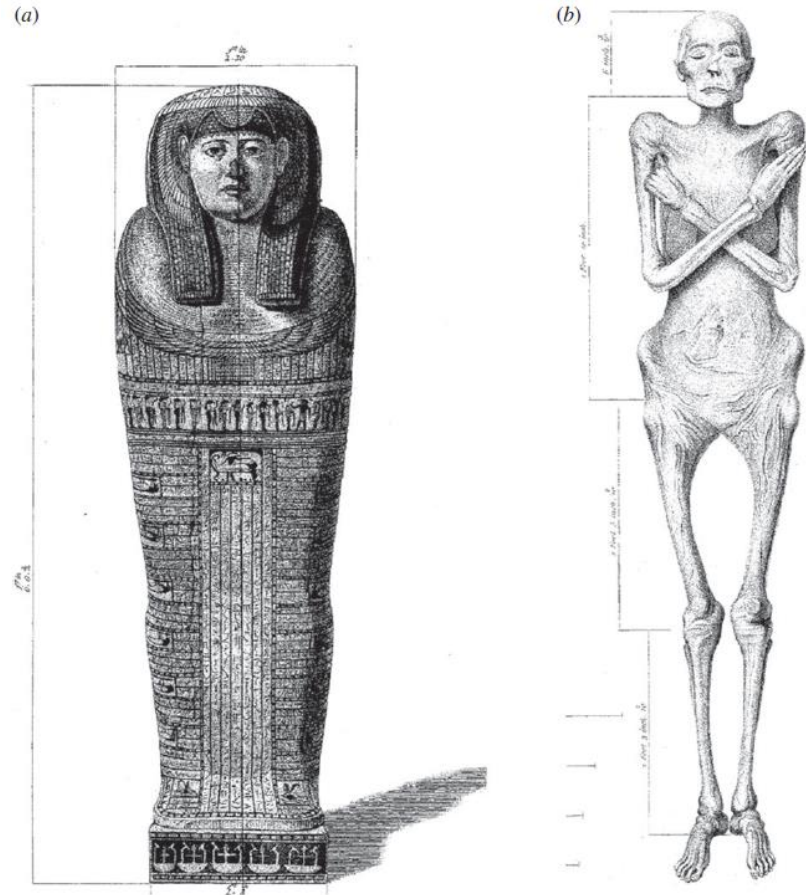
Lithuania and Columbia became members of the Organization for Economic Co-operation and Development in 2018 and 2020, respectively.

인간이 결핵을 앓았다는 가장 오래된 증거: 고대 이집트인의 미라

Whit plague (백색 흑사병)

Consumption (소모성 질환)

Robert Koch에 의해 결핵균 발견 (1882년)



결핵

결핵균에 의해 발생하는 만성 감염성 질환. *Mycobacterium tuberculosis complex*



R. Koch

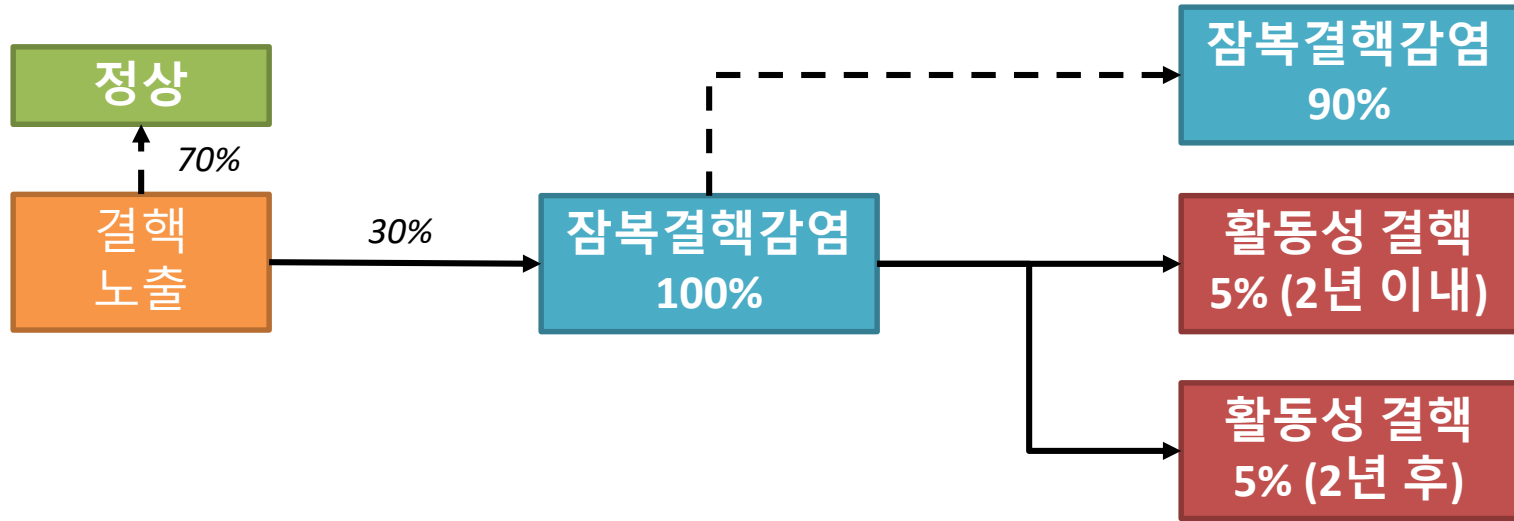


March 24, 1882
Announced his discovery
of *M. tuberculosis*



A scanning electron
micrograph of gram-
positive *Mycobacterium
tuberculosis* bacteria

결핵의 발병



예) 100명이 노출되었으면, 30명이 잠복결핵감염 진단. 그 중 3명이 활동성 결핵으로 발병.

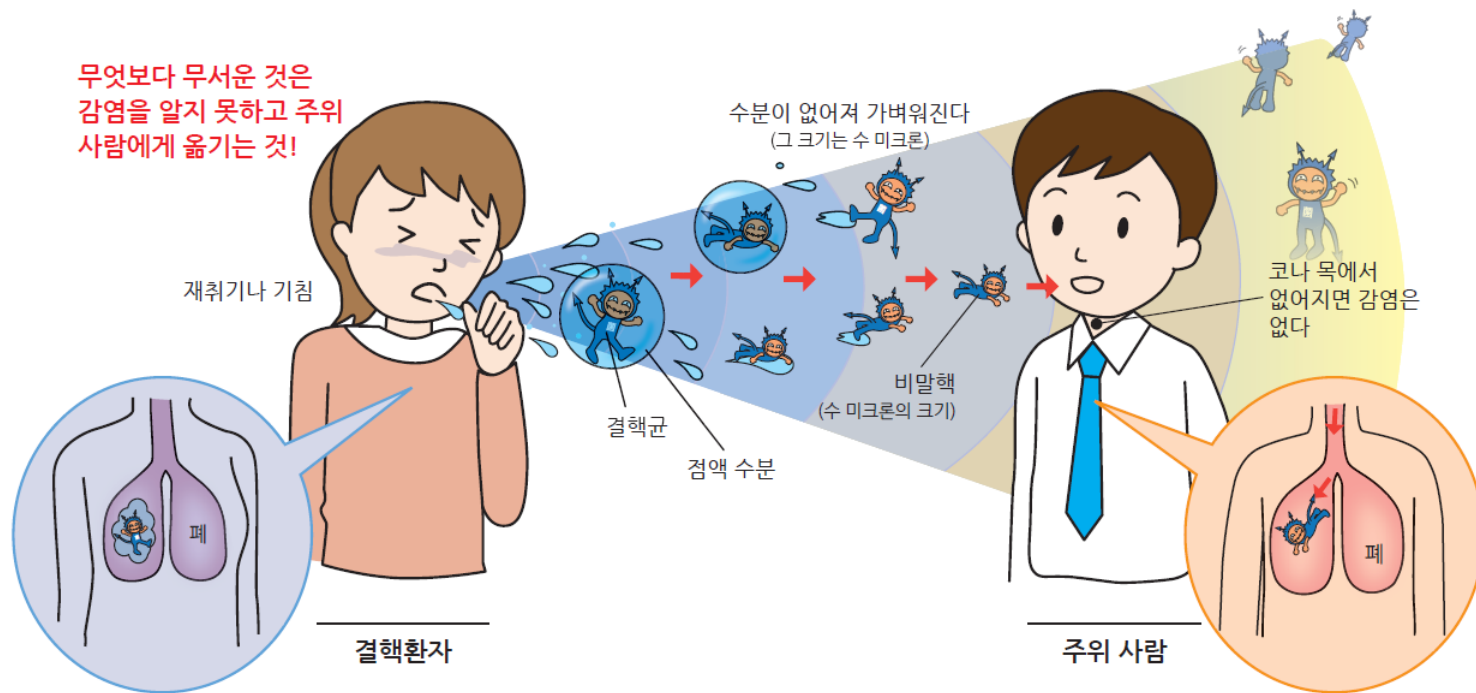
Most persons with LTBI never become sick with TB; however, approximately 5 to 15% have progression to TB disease.

Shah M et al. N Engl J Med 2021.

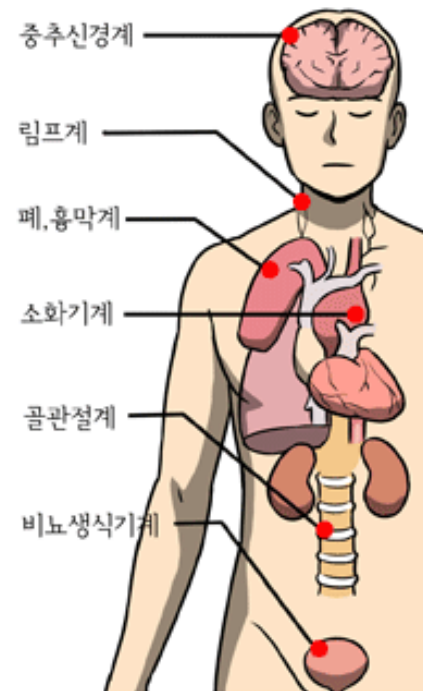
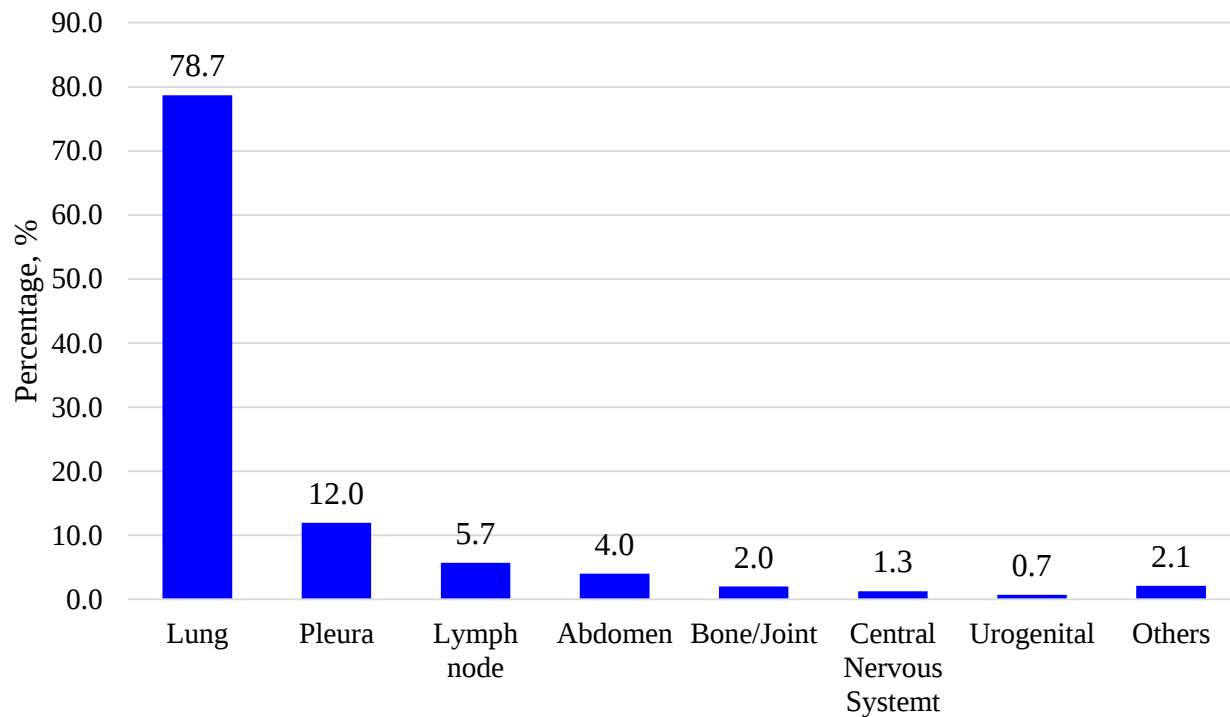
결핵에 대한 흔한 오해



호흡기를 통해 감염



Sites of TB involvement among 7,674 patients with TB in Korea



객담 검사

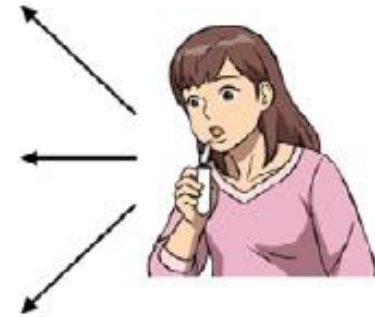
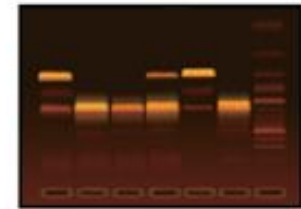
항산균 도말 검사
(소요시간: 2-3일)



항산균 배양 검사
(소요시간: 6-8주)



핵산증폭검사
(소요시간: 2-3일)

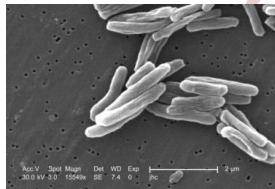


결핵 치료의 역사



R. Koch

1882년 결핵균 발견



1950년대

Isoniazid

Pyrazinamide

Cycloserine

1940년대

Streptomycin

PAS

1960년대

Ethambutol

Rifampicin

Rifampicin 도입:
9개월 단기치료 시행

1990년대 이후
HREZ or SM
6개월 단기치료

성인 60kg 결핵 환자

전체 총수량
= 11

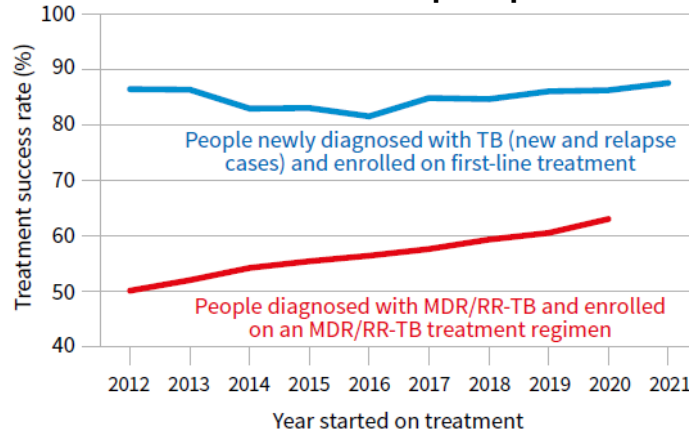
항결핵제 종류	함량	총 용량	총수량	그림
이소니아지드	100mg	300mg	3	
리팜핀	600mg	600mg	1	
에탐부톨	400mg	1200mg	3	
피라진아미드	500mg	1500mg	3	
피리독신	50mg	50mg	1	

Drug-Susceptible Tuberculosis

- Current standard 4-drug treatment regimen of 1st line drugs
 - Cure rate of
 - >95% in trial conditions
 - >90% in treatment under the oversight of TB-control programs

N Engl J Med 2013;368:745-755

- Global success rates for people treated for TB, 2012–2021



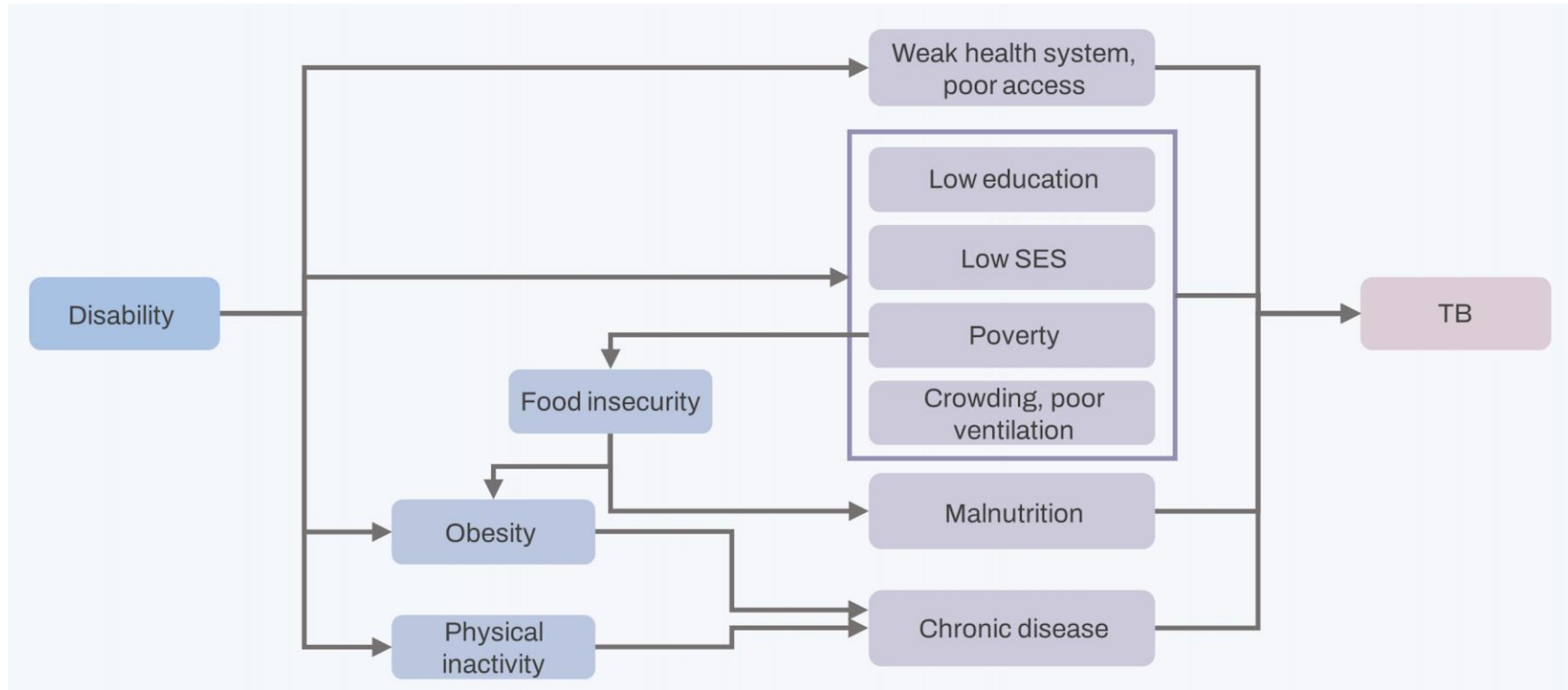
Global Tuberculosis Report, WHOI, 2023.

목차

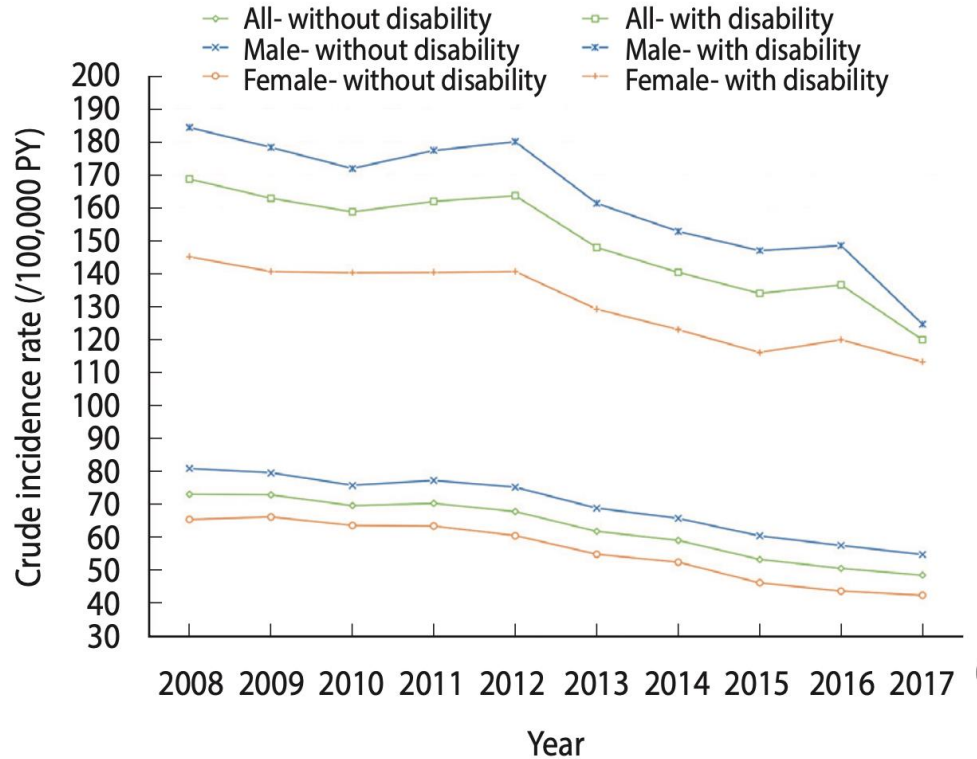
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Conditions of disability overlap with the risk factors for developing TB disease



TB incidence between people with and without disability



TB incidence between people with and without disability

Status of disability	OR (95% CI)	aOR (95% CI)
Without disability	Reference	Reference
With disability	2.47 (2.38 – 2.57)	1.19 (1.15 – 1.24)

Multivariable model was adjusted for age (continuous), sex, income level, and place of residence.

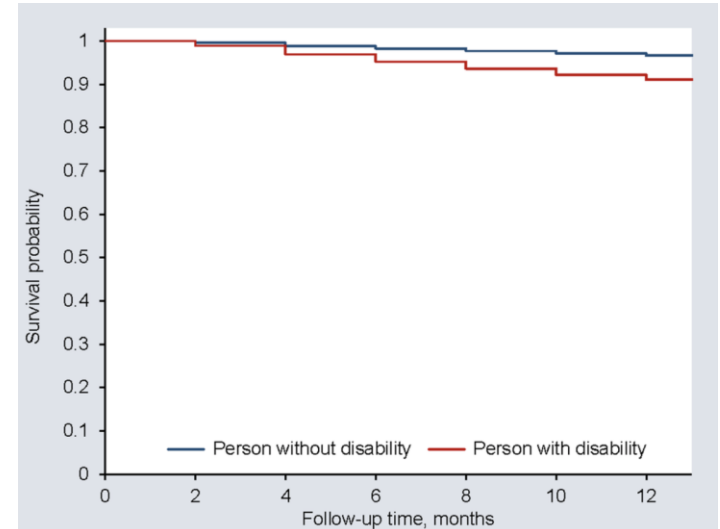
Disability is a risk factor for 1-year mortality after TB diagnosis

J. Min,¹ J.E. Park,² S.Y. Kim,^{2,3,4} Y.Y. Kim,^{5,6} J.H. Park^{2,3,4}

Table 3. Cox regression analysis of disability as a predictor of all-cause mortality within 1 year after TB diagnosis among enrolled participants with TB.

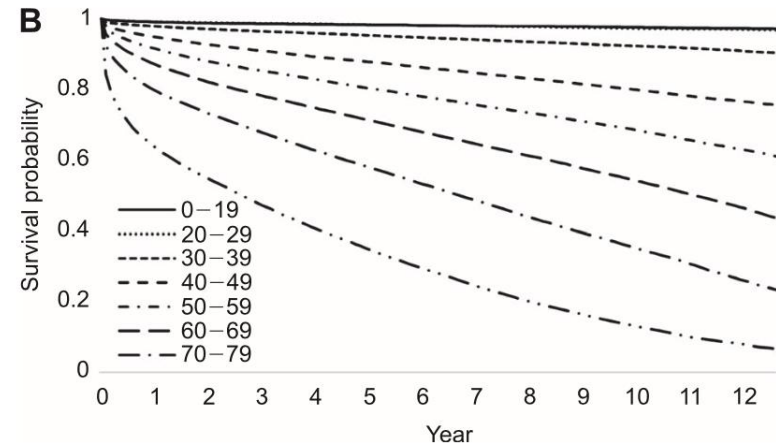
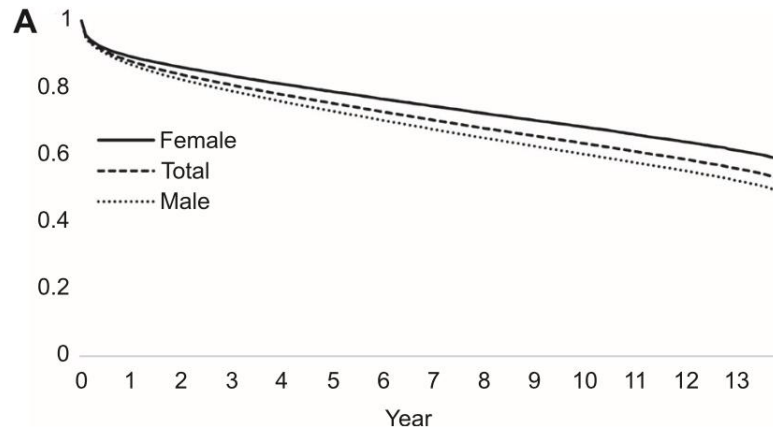
Variables	Hazard ratio (95% confidence interval)	
	Crude	Adjusted*
Disability status		
Without disability	1.00	1.00
With disability	2.72 (2.61–2.84)	1.24 (1.19–1.29)
Age, per 10 years	2.19 (2.16–2.22)	2.06 (2.02–2.09)
Sex		
Female	1.00	1.00
Male	1.43 (1.38–1.48)	1.91 (1.84–1.98)
Income level		
Fourth quartile (highest)	1.00	1.00
Third quartile	0.73 (0.70–0.77)	1.14 (1.08–1.20)
Second quartile	0.61 (0.58–0.65)	1.19 (1.13–1.26)
First quartile	0.76 (0.72–0.80)	1.20 (1.14–1.26)
Medical aid (lowest)	1.71 (1.62–1.81)	1.36 (1.28–1.44)
Place of residence		
Metropolitan	1.00	1.00
Urban	1.33 (1.27–1.38)	0.99 (0.95–1.03)
Rural	1.85 (1.76–1.93)	0.92 (0.88–0.96)
Charlson Comorbidity Index		
0	1.00	1.00
1–2	4.17 (3.68–4.72)	1.82 (1.61–2.07)
3–4	14.20 (12.57–16.03)	3.45 (3.05–3.91)
≥ 5	40.05 (35.53–45.14)	7.82 (6.92–8.84)

*Adjusted for age, sex, income level, place of residence, and Charlson Comorbidity Index.



Long-term mortality of patients with tuberculosis in Korea

- NHIS & KOSIS databases in the Republic of Korea, 2003-2016
- Mean follow-up period; 74.3 ± 51.7 months
- Survival probability at 1, 5, and 10 years after diagnosis; 87.8%, 75.3%, and 63.3%
- Overall SMR of TB patients to the general population ; 3.23 (95% CI, 3.21–3.25)



Long-term mortality of patients with tuberculosis in Korea

Table 2 Cause of death following tuberculosis diagnosis by time period

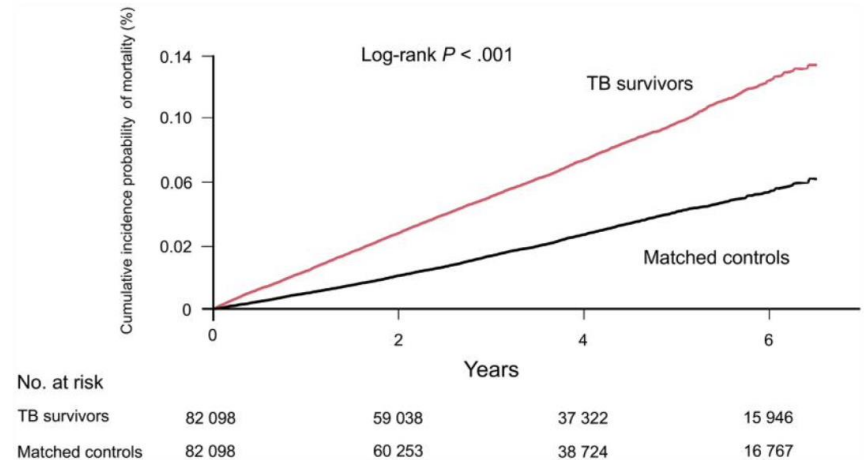
Causes of death	Total period n (%)	Within 1 year n (%)	1–5 years n (%)	After 5 years n (%)
Tuberculosis	21 070 (20.3)	15 278 (37.7)	3 884 (10.7)	1 908 (7.1)
Pneumonia	4 802 (4.6)	1 389 (3.4)	1 690 (4.6)	1 723 (6.4)
CLRD	5 307 (5.1)	1 107 (2.7)	2 108 (5.8)	2 092 (7.8)
Lung cancer	9 897 (9.5)	4 287 (10.6)	3 869 (10.6)	1 741 (6.5)
Other cancers	14 980 (14.4)	5 226 (12.9)	5 955 (16.3)	3 799 (14.2)
CDVD	6 250 (6.0)	1 799 (4.4)	2 247 (6.2)	2 204 (8.2)
CBVD	6 152 (5.9)	1 924 (4.7)	2 408 (6.6)	1 820 (6.8)
DM	4 548 (4.4)	1 302 (3.2)	1 918 (5.3)	1 328 (5.0)
Hypertension	1 319 (1.3)	368 (0.9)	510 (1.4)	441 (1.6)
Others	28 307 (27.3)	7 368 (18.2)	11 487 (31.5)	9 452 (35.4)
Unknown	1 050 (1.0)	467 (1.2)	361 (1.0)	222 (0.8)
Total	103 682 (100.0)	40 515 (100.0)	36 437 (100.0)	26 730 (100.0)

CLRD = chronic lower respiratory disease; CDVD = cardiovascular disease; CBVD = cerebrovascular disease; DM = diabetes mellitus.

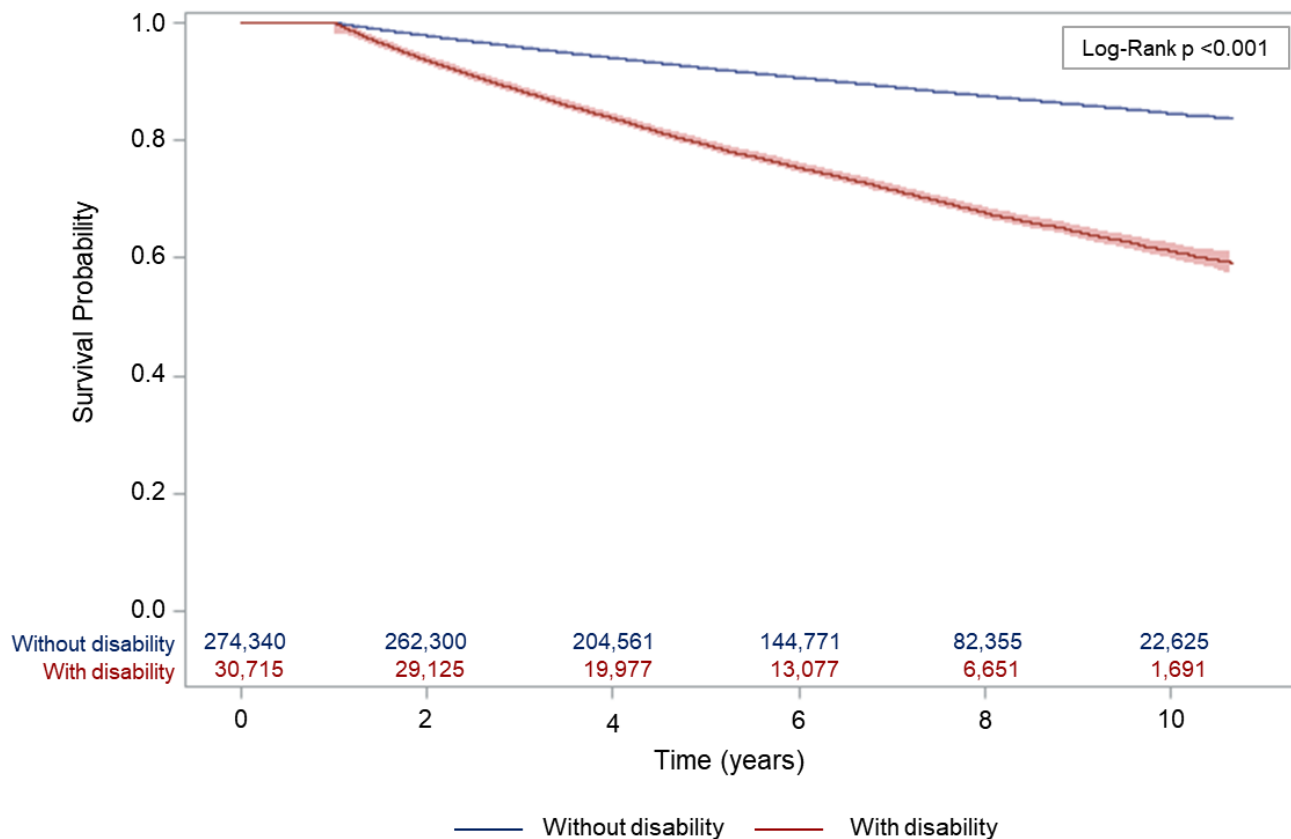
Long-Term Mortality of Tuberculosis Survivors in Korea: A Population-based Longitudinal Study

- NHIS database in the Republic of Korea
- TB survivors (n=82,098) aged ≥ 20 years between 2010 and 2017, and 1:1 age- and sex-matched controls (n=82,098)
- Followed up for death 1 year after study enrollment until Dec 2018
- Long-term mortality was adjusted for behavior habits (smoking, alcohol consumption, or exercise), income level, BMI, & comorbidities
- Mortality risk in TB survivor
 - aHR, 1.62 (95% CI, 1.54–1.70)

The long-term mortality risk was significantly higher in TB survivors than those in the matched controls, even after adjusting for potential confounders.



Long-term mortality after tuberculosis among people with disabilities in Korea



Cox regression analysis of disability as a predictor of long-term all-cause mortality among tuberculosis survivors

Status of disability	HR (95% CI)	aHR (95% CI)
Without disability	Reference	Reference
With disability	2.90 (2.82 – 2.97)	1.33 (1.30 – 1.37)

Multivariable model was adjusted for age, sex, income level, place of residence, and Charlson Comorbidity Index.

목차

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- 결핵 후유증으로 인한 장애



만성폐쇄성폐질환

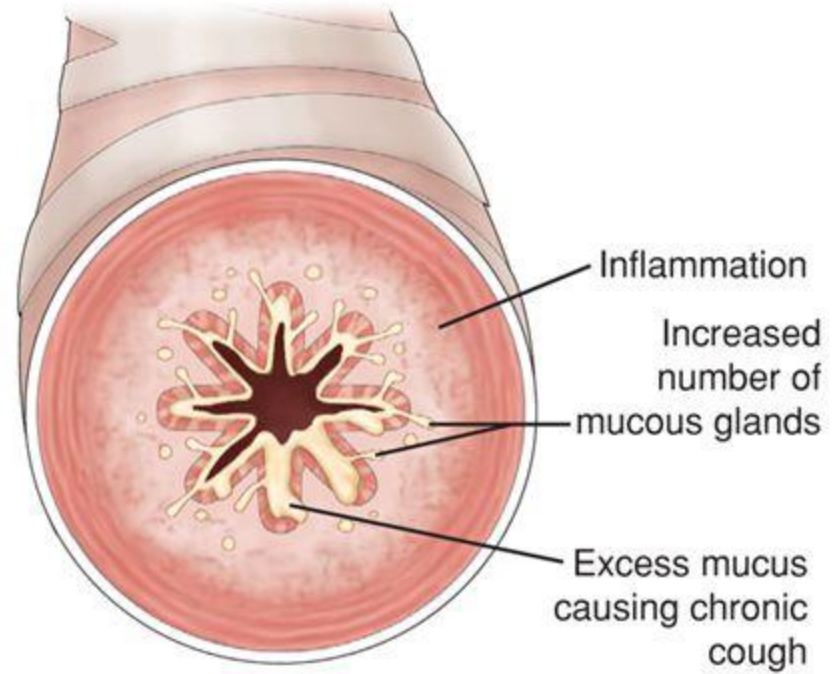
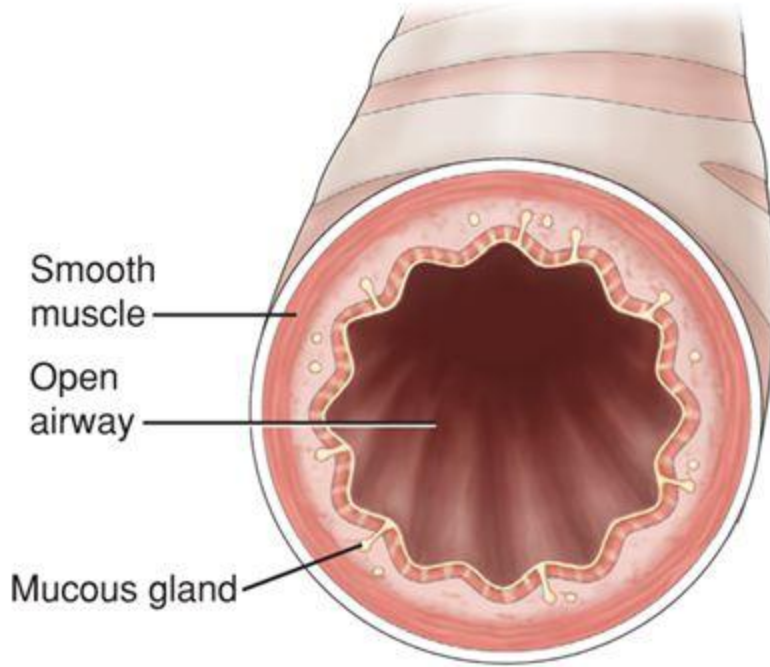
Chronic Obstructive Pulmonary Disease COPD

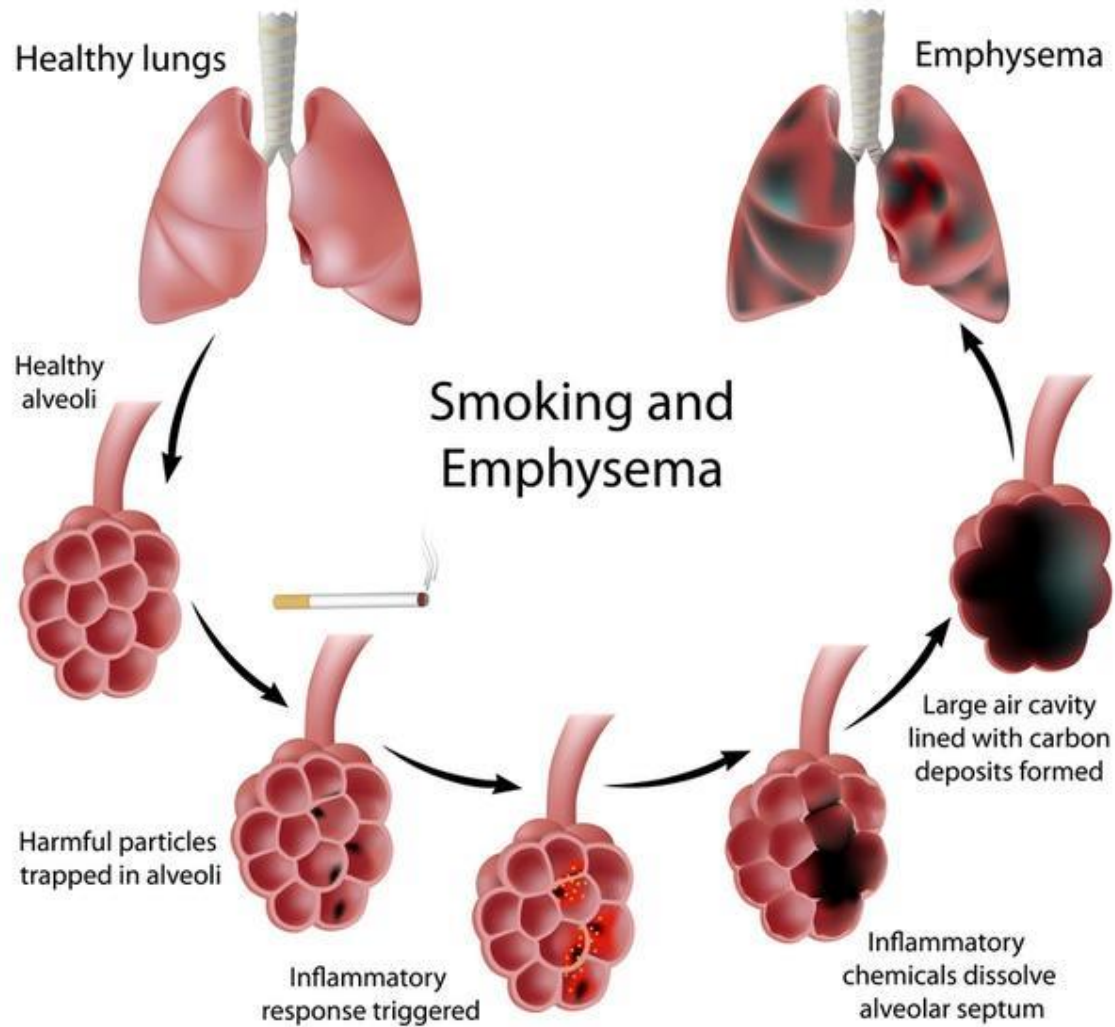
- 정의

- 기도나 폐포의 이상(기관지염, 세기관지염, 폐기종)으로 인해 공기의 흐름(기류)이 제한되며 이로 인해 만성적인 호흡기 증상(숨참, 기침, 가래)을 보이는 폐의 질환이다.
- 기도와 폐포의 이상은 다양한 원인에 의해 생기며, **기류의 제한은 지속적**이고 꾸준히 진행될 수 있다

NORMAL BRONCHUS

CHRONIC BRONCHITIS

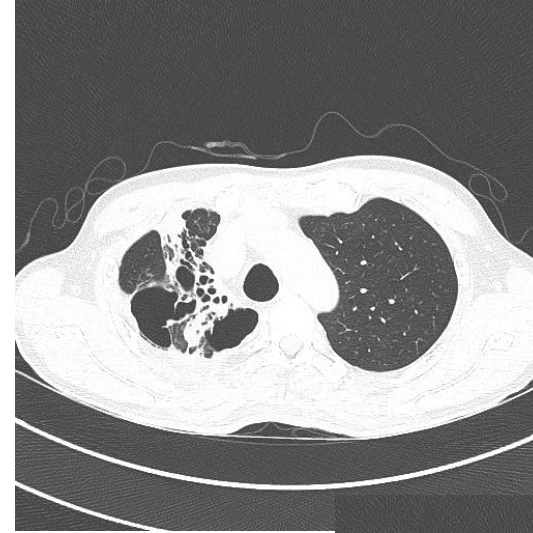




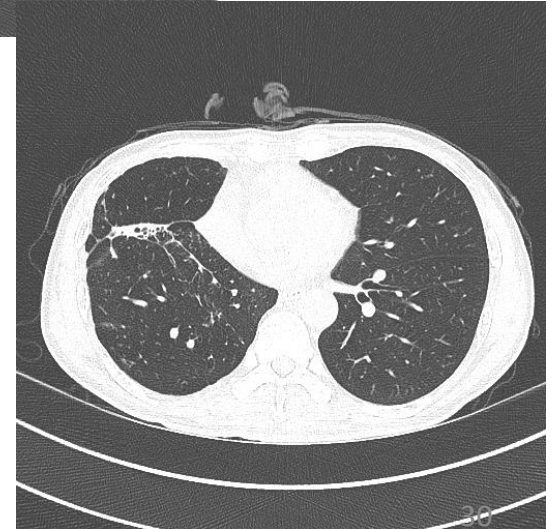
Case: 48/M patient with persistent cough



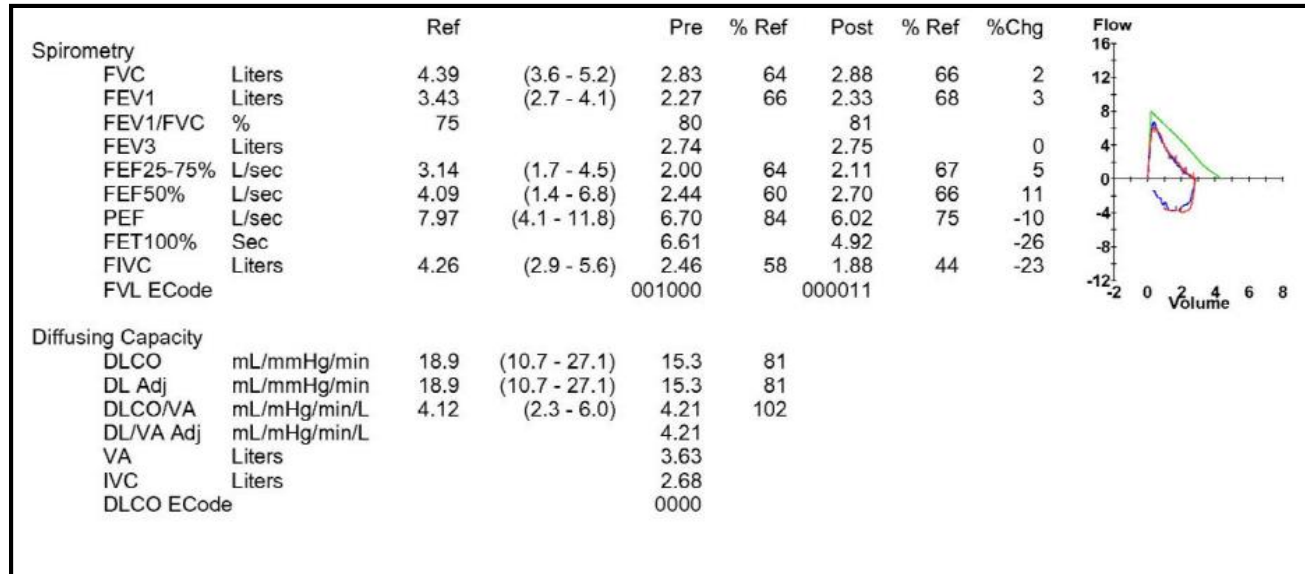
Chest X-ray
initial:2016.11.09
f/u: 2017.09.13



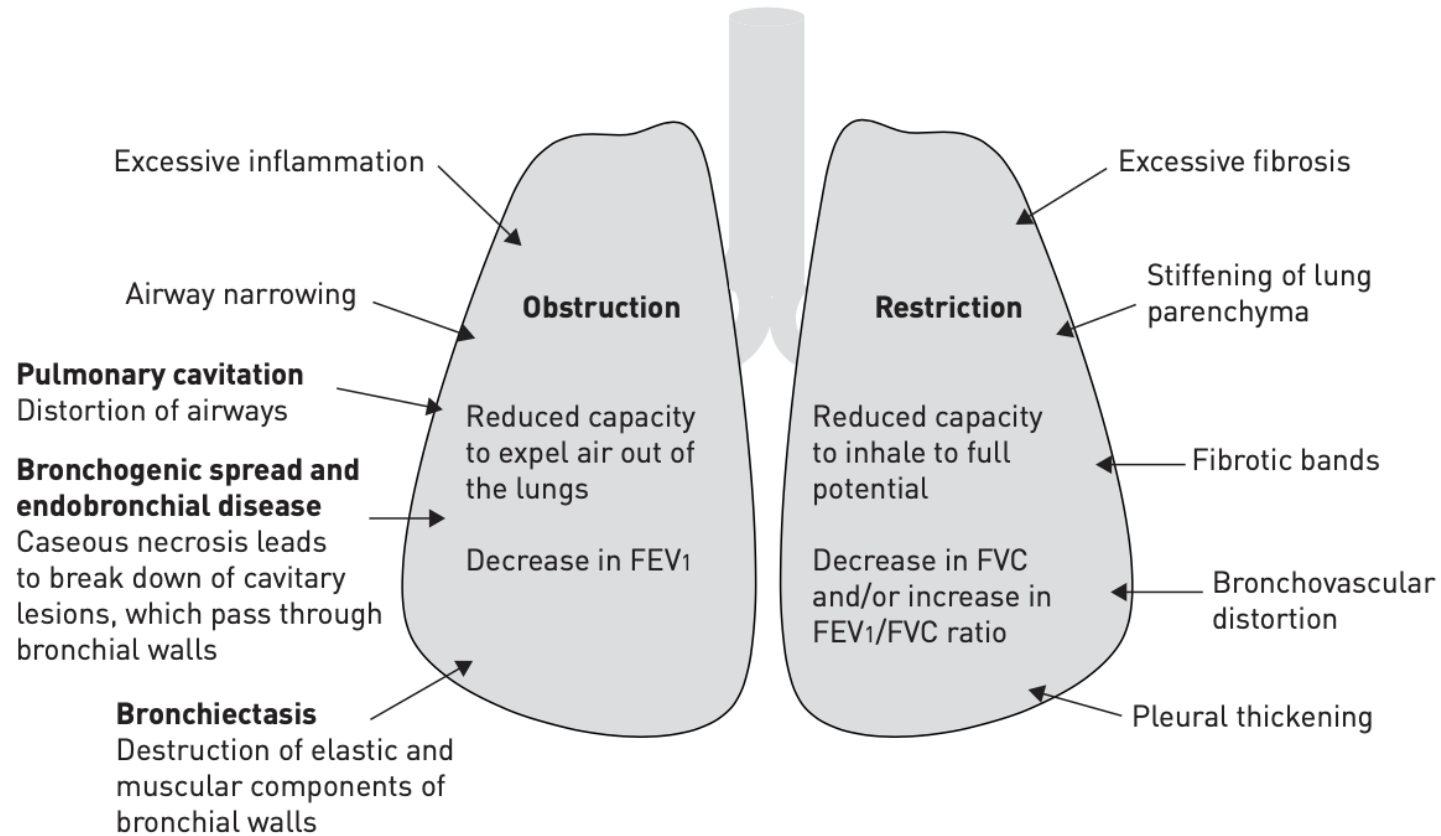
Chest CT f/u
2017.08



Case: 48/M patient with persistent cough



- Pulmonary function test after completion of anti-TB treatment
 - Combined obstructive and restrictive pattern
- Diagnosis: TB-destroyed lung with chronic airway obstruction



Mechanisms and radiographic features associated with airflow obstruction and restrictive ventilatory defects in patients with a history of TB

Post-tuberculosis lung disease

- Defined as ...
 - Evidence of a chronic respiratory abnormality, with or without symptoms, attributable at least in part to previous tuberculosis
 - *1st International Post-Tuberculosis Symposium (2019)*
- 결핵 후 폐질환
 - 과거 폐결핵으로 인한 만성적인 호흡기계 이상 소견
 - *결핵 진료지침, 제5판 (2024), 55쪽*

TB-destroyed lung

COPD (*Chronic obstructive pulmonary disease*)

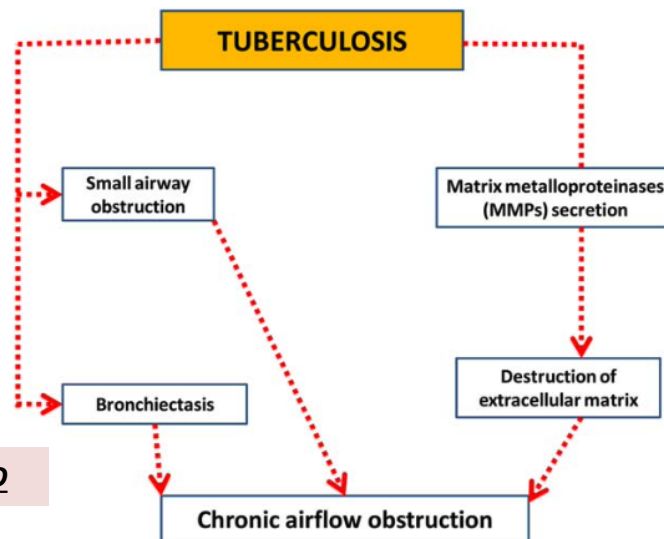
TOPD (*TB-associated obstructive pulmonary disease*)

Proposed taxonomy (etiotypes) for COPD

Classification	Description
Genetically determined COPD (COPD-G)	Alpha-1 antitrypsin deficiency (AATD) Other genetic variants with smaller effects acting in combination
COPD due to abnormal lung development (COPD-D)	Early life events, including premature birth and low birthweight, among others
Environmental COPD	
Cigarette smoking COPD (COPD-C)	- Exposure to tobacco smoke, including <i>in utero</i> or <i>via</i> passive smoking - Vaping or e-cigarette use - Cannabis
Biomass and pollution exposure COPD (COPD-P)	Exposure to household pollution, ambient air pollution, wildfire smoke, occupational hazards
COPD due to infections (COPD-I)	Childhood infections, HIV-associated COPD
COPD and asthma (COPD-A)	Particularly childhood asthma
COPD of unknown cause (COPD-U)	

Adapted from CELLI *et al.* [2] and STOLZ *et al.* [72].

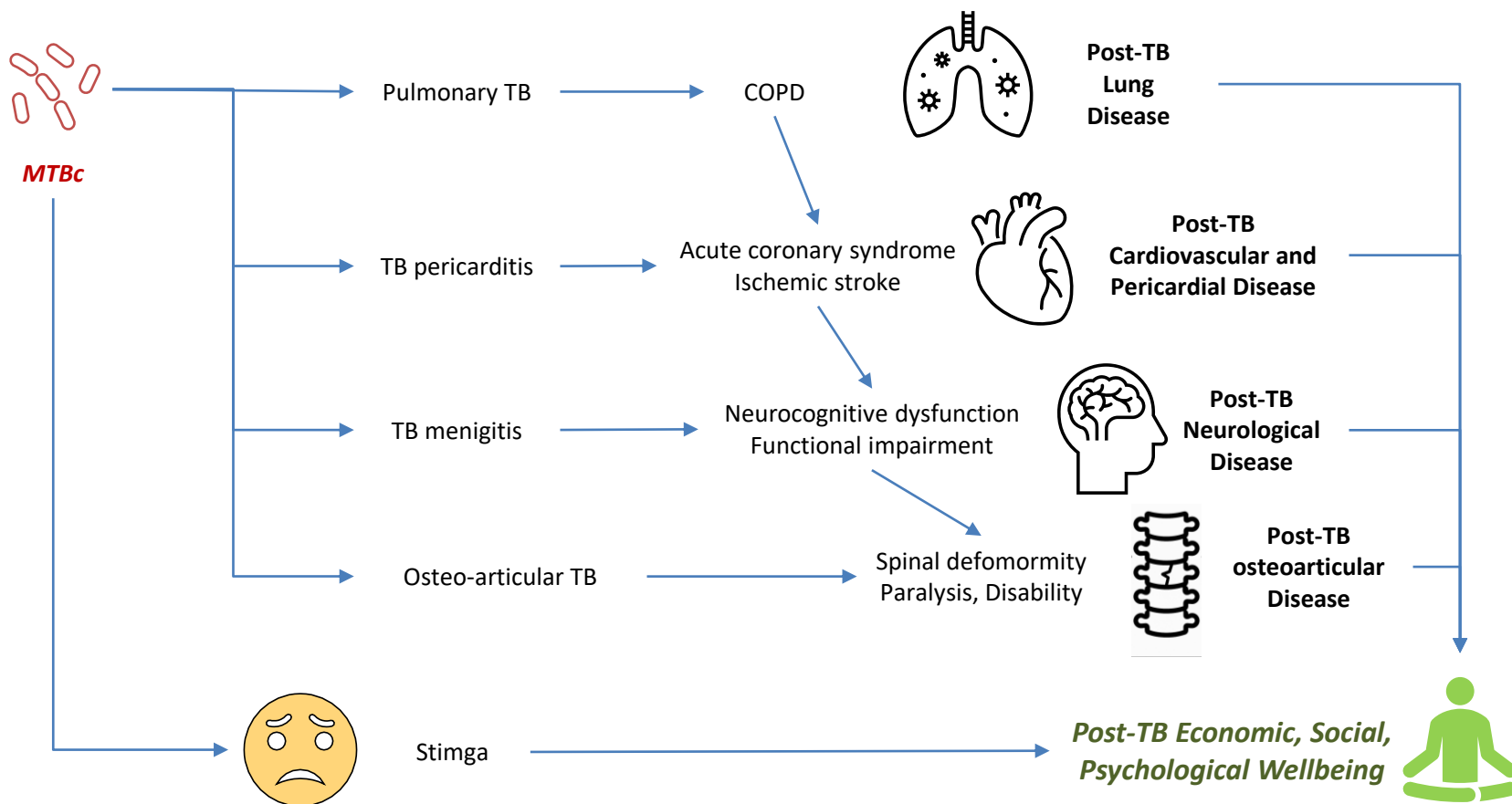
Tuberculosis-associated COPD



Mechanism of airflow obstructions due to TB

Similarities and differences PTLD and COPD-C

Characteristics	Similarities	Differences	
		PTLD	Cigarette smoking COPD
Host	Mostly in older people	Becom patients after episode of pulmonary TB	Gradually worsens while smoking for many years or by aging
Clinical symptoms	Mostly respiratory symptoms: cough, sputum and/or dyspnea	Hemoptysis	Dyspnea
Imaging	Emphysema and chronic bronchitis	Very heterogenous: granulomas/fibrosis, calcification, bronchiectasis, gas-trapping, tracheobronchial stenosis, pleural thickening	Overall hyperinflated
Lung pathology and pulmonary function	Chronic airway obstruction, decreased diffusion capaticy	Airway obstruction, restriction, or mixed patterns	Airflow obstruction



2024년 등록장애인 현황

- 2024년 말 기준 등록장애인은 2,631,356명

구분	지체	청각	시각	뇌병변	지적	신장	정신	자폐성	언어	장루요루	간	호흡기	뇌전증	심장	안면	합계
	1,132,644	442,034	246,182	234,703	233,322	111,084	103,215	47,350	22,389	17,397	16,098	10,512	6,889	4,781	2,756	2,631,356
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	43.0%	16.8%	9.4%	8.9%	8.9%	4.2%	3.9%	1.8%	0.9%	0.7%	0.6%	0.4%	0.3%	0.2%	0.1%	100.0%

- 2024년 한 해 동안 새롭게 등록된 장애인은 85,947명

구분	지체	청각	시각	뇌병변	지적	신장	정신	자폐성	언어	장루요루	간	호흡기	뇌전증	심장	안면	합계
	14,239	27,284	6,155	13,622	5,034	9,521	1,839	2,948	1,655	1,420	907	898	167	220	38	85,947
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	16.6%	31.7%	7.2%	15.8%	5.9%	11.1%	2.1%	3.4%	1.9%	1.7%	1.1%	1.0%	0.2%	0.3%	0.0%	100.0%

보건복지부. 보도자료. 2025.04.18

https://www.mohw.go.kr/board.es?mid=a10503010100&bid=0027&act=view&list_no=1485363&tag=&nPage=1

2024년 등록장애인 현황

- 2024년 신규 장애인의 장애유형별, 65세 전후 비교

구분	지체	청각	시각	뇌병변	지적	신장	정신	자폐성	언어	장루요루	간	호흡기	뇌전증	심장	안면	합계
	14,239 100.0%	27,284 100.0%	6,155 100.0%	13,622 100.0%	5,034 100.0%	9,521 100.0%	1,839 100.0%	2,948 100.0%	1,655 100.0%	1,420 100.0%	907 100.0%	898 100.0%	167 100.0%	220 100.0%	38 100.0%	85,947 100.0%
	16.6%	31.7%	7.2%	15.8%	5.9%	11.1%	2.1%	3.4%	1.9%	1.7%	1.1%	1.0%	0.2%	0.3%	0.0%	100.0%
65세 미만	6,931 48.7%	2,864 10.5%	2,531 41.1%	5,983 43.9%	5,008 99.5%	4,452 46.8%	1,738 94.5%	2,948 100.0%	1,338 80.8%	570 40.1%	740 81.6%	322 35.9%	165 98.8%	135 61.4%	35 92.1%	35,760 41.6%
	19.4%	8.0%	7.1%	16.7%	14.0%	12.4%	4.9%	8.2%	3.7%	1.6%	2.1%	0.9%	0.5%	0.4%	0.1%	100.0%
65세 이상	7,308 51.3%	24,420 89.5%	3,624 58.9%	7,639 56.1%	26 0.5%	5,069 53.2%	101 5.5%	0 0.0%	317 19.2%	850 59.9%	167 18.4%	576 64.1%	2 1.2%	85 38.6%	3 7.9%	50,187 58.4%
	14.6%	48.7%	7.2%	15.2%	0.1%	10.1%	0.2%	0.0%	0.6%	1.7%	0.3%	1.1%	0.0%	0.2%	0.0%	100.0%

보건복지부. 보도자료. 2025.04.18

https://www.mohw.go.kr/board.es?mid=a10503010100&bid=0027&act=view&list_no=1485363&tag=&nPage=1

호흡기장애를 유발하는 원인

- 2003 – 2004 년 대학병원

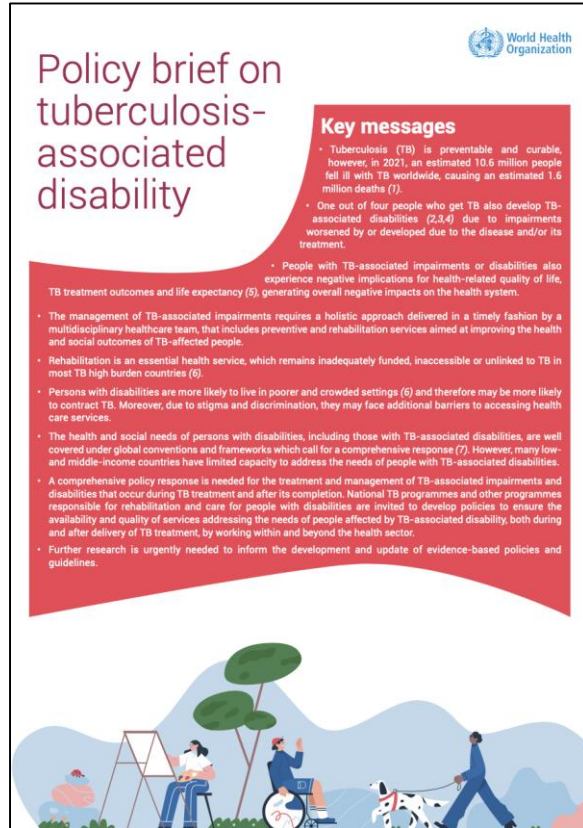
	총 118명
만성폐쇄성폐질환	38% (45)
결핵 후 폐손상	23% (27)
천식	23% (27)
기관지확장증	6.7% (8)
간질성폐질환	4.0% (5)
폐절제술	2.5% (3)
폐암	0.8% (1)

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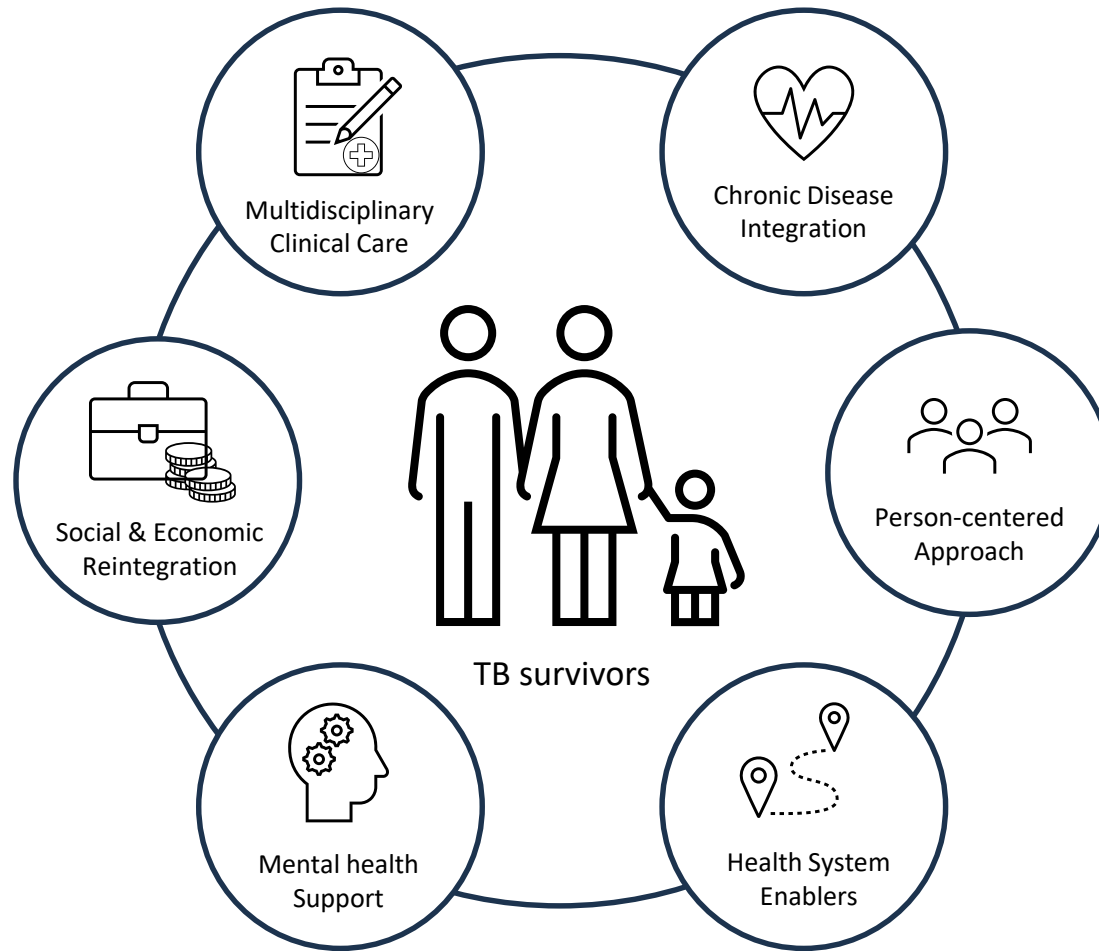


- 결핵은 예방과 치료가 가능한 질병
 - 2021년 전 세계적
 - 약 1,060만 명이 결핵 발병
 - 160만 명이 사망
- 결핵 환자 4명 중 1명
 - 결핵 관련 장애(TB-associated disability) 경험
 - 질병 자체 또는 치료로 인한 손상
- 결핵 관련 장애
 - 삶의 질 저하, 치료 성적 악화, 기대수명 단축 등의 부정적 영향
 - 보건의료체계 전반에도 부담을 줍니다.
- 예방과 재활을 포함한 다학제적이고 포괄적인 접근 필요

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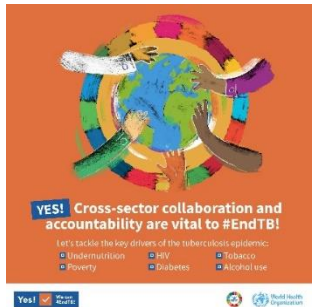


- 고부담국
 - 재활 서비스가 충분히 자금 지원되지 않거나 접근이 어려움
 - 결핵 진료체계와 연계 없음
- 장애인
 - 빈곤, 과밀한 주거환경, 차별과 낙인으로 인해 결핵에 더 취약
 - 의료 접근성에 제약
- 결핵 관련 장애인을 포함한 장애인의 건강 및 사회적 필요에 대한 포괄적 대응을 요구
- 결핵 관련 장애에 대한 정책적·체계적 대응을 강화
 - 보건 및 사회부문 간 연계된 서비스 체계 구축
- 근거 기반의 정책 및 지침 수립을 위한 연구가 시급



Summary

- 결핵 관련 장애
- 다학제적 접근을 통한 건강관리와 삶의 질



Thank you for your attention

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