

**Abstract**

## Results of the 2020 elderly Tuberculosis (TB) screening in Republic of Korea

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The Korea Disease Control and Prevention Agency (KDCA) conducted an early-stage tuberculosis (TB) screening project for the elderly in 2020. The aim was to detect TB in seniors over the age of 65 living in regions with high TB incidences and high TB-related deaths, and to prevent transmission.

The screening method consisted of mobile examinations, visiting examinations, and regular examinations linked to examination institutions, and the examination survey and chest X-ray examination were conducted primarily, and a sputum examination was conducted for abnormal findings of chest X-ray and TB symptoms.

134,478 people were participated in total. Chest x-ray (134,467) and sputum tests (17,647) were performed and 98 TB patients (72.9 people per 100,000 population) were reported.

This was about 1.9 times higher than the incidence of TB in the general population (38.8 people per 100,000 population, 19,933 people). In the case of males, the elderly people, smokers, community residences, living alone, symptoms of TB, and histories of TB within the family show increased the TB incidence. In addition, 52.0% (51) of TB confirmed patients were identified as having inactive TB chest X-ray examination.

Furthermore, as a result of analyzing the treatment success rate of TB patients in a 2018-2019 project for TB screening for the elderly, it was found that the treatment success rate was higher than that of the general population. This confirmed that early detection and follow-up of TB patients increased the success rate of treatment for TB.

The KDCA continued its elderly TB screening project in 2021. Through this, early detection and treatment of TB patients will prevent transmission. It intends to contribute to lowering the incidence of tuberculosis in Korea.

**Keywords:** Tuberculosis (TB), Elderly, Chest X-ray examination, Sputum examination, Incidence

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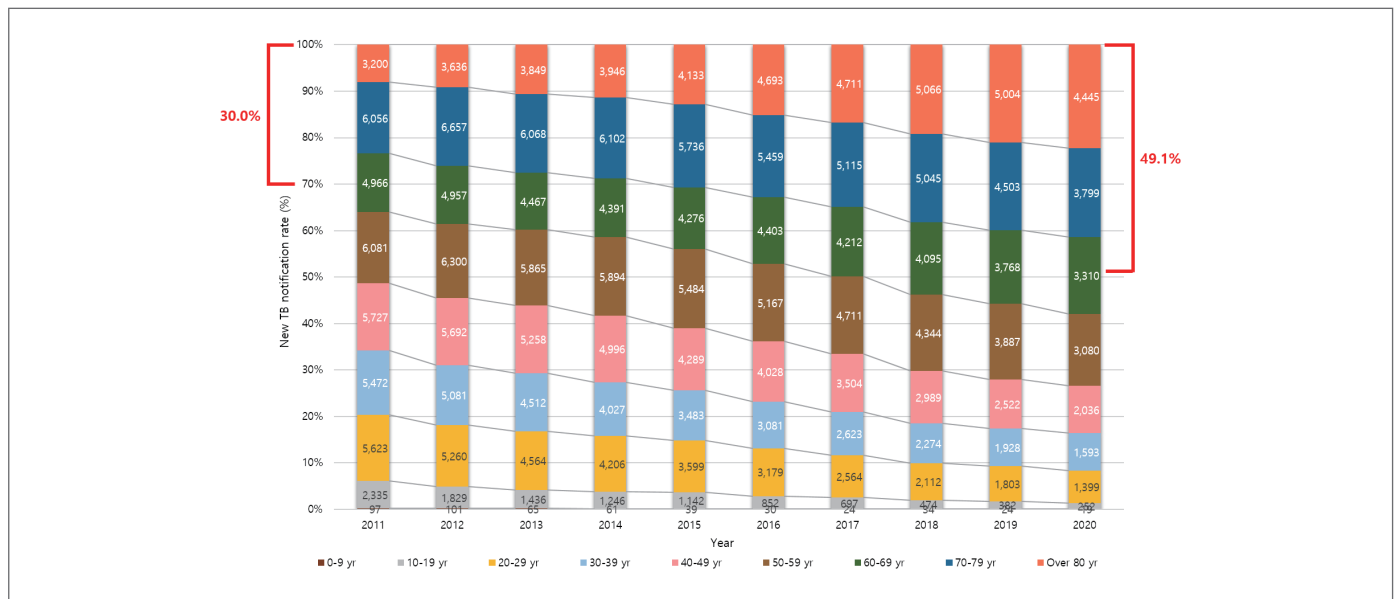


Figure 1. New tuberculosis (TB) notification rates by age, 2011–2020

\* Source: Annual Report on the Notified Tuberculosis in Korea, 2020, KDCA

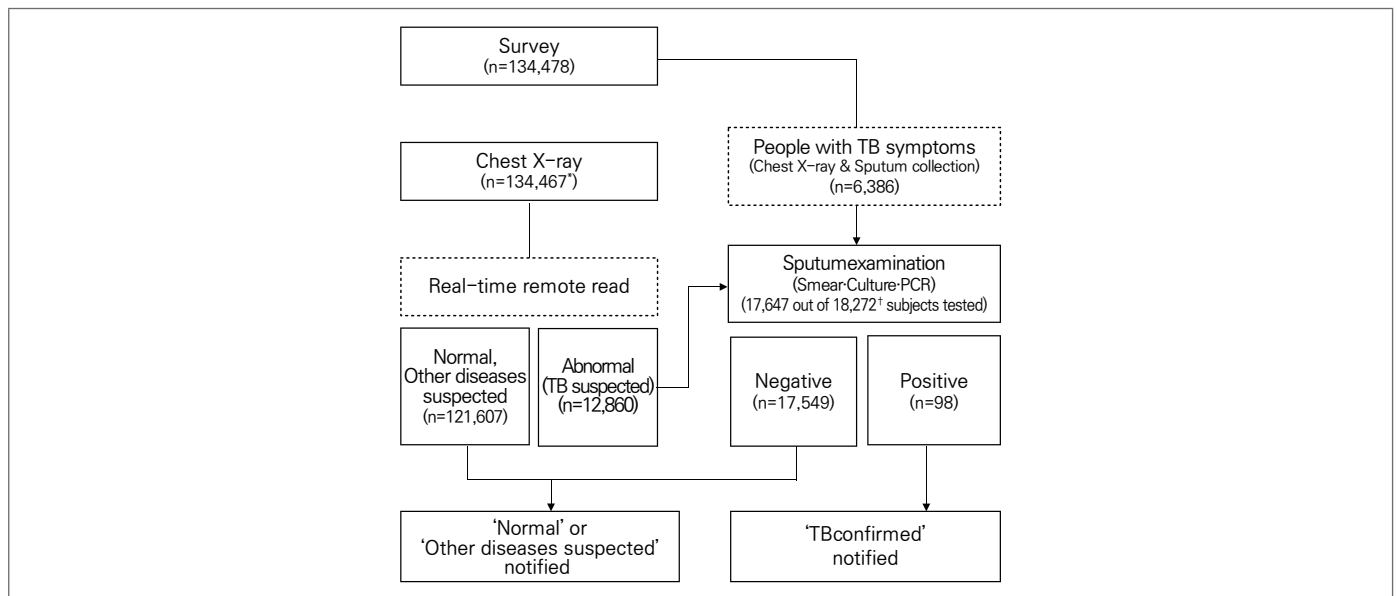


Figure 2. Tuberculosis (TB) screening procedure

\* Only sputum examination is performed on 11 patients who refused chest X-ray examination.

† Excluding 974 people who have TB symptoms and abnormal result

Table 1. Characteristics of tuberculosis (TB) screening participants

Variables	Participants					
	Total		Community		Long-term care facility	
	n	%	n	%	n	%
<b>Total</b>	134,478	100.0	69,127	51.4	65,351	48.6
<b>Sex</b>						
Male	32,852	24.4	19,269	27.9	13,583	20.8
Female	101,626	75.6	49,858	72.1	51,768	79.2
<b>Age</b>						
≤ 64	15,627	11.6	7,282	10.5	8,345	12.8
65–69	7,718	5.8	5,024	7.3	2,694	4.1
70–74	12,370	9.2	8,859	12.8	3,511	5.3
75–79	20,900	15.5	13,734	19.9	7,166	11.0
≥ 80	77,863	57.9	34,228	49.5	43,635	66.8
<b>BMI (Kg/m<sup>2</sup>)</b>						
Under weight(<18.5)	17,113	12.7	4,566	6.6	12,547	19.2
Normal weight(18.5–22.9)	63,731	47.4	32,130	46.4	31,601	48.4
Over weight(23.0–24.9)	27,549	20.5	16,564	24.0	10,985	16.8
Obese(≥25.0)	26,083	19.4	15,865	23.0	10,218	15.6
Unknown	2	0.0	2	0.0	0	0.0
<b>Area</b>						
Seoul	13,862	10.3	6,884	10.0	6,978	10.7
Busan	9,950	7.4	5,865	8.5	4,085	6.3
Daegu	8,714	6.5	5,313	7.7	3,401	5.2
Incheon	7,396	5.5	3,073	4.4	4,323	6.6
Gwangju	4,543	3.4	3,293	4.8	1,250	1.9
Daejeon	5,033	3.7	3,309	4.8	1,724	2.6
Ulsan	1,987	1.5	1,432	2.1	555	0.9
Sejong	732	0.5	508	0.7	224	0.3
Gyeonggi	16,823	12.5	4,456	6.4	12,367	18.9
Gangwon	6,782	5.0	3,011	4.4	3,771	5.8
Chungbuk	6,259	4.7	3,278	4.7	2,981	4.6
Chungnam	10,189	7.6	6,245	9.0	3,944	6.0
Jeonbuk	10,626	7.9	9,096	13.2	1,530	2.3
Jeonnam	8,895	6.6	2,822	13.2	1,530	2.3
Jeonnam	8,895	6.6	2,822	4.1	6,073	9.3
Gyeongbuk	10,046	7.5	4,189	6.1	5,857	9.0
Gyeongnam	9,694	7.2	5,646	8.2	4,048	6.2
Jeju	2,947	2.2	707	1.0	2,240	3.4
<b>Type of insurance</b>						
National health insurance (work, district)	107,618	80.0	57,710	83.5	49,908	76.4
Medical care (type1, 2)	23,849	17.7	9,785	14.2	14,064	21.5
None	3,011	2.3	1,632	2.4	1,379	2.1
<b>Residence type</b>						
Long-term-care facility	65,351	48.6	0	0.0	65,351	100.0
Community	69,127	51.4	69,127	100.0	0	0.0

Table 1. (Continued) Characteristics of tuberculosis (TB) screening participants

Variables	Participants					
	Total		Community		Long-term care facility	
	n	%	n	%	n	%
<b>Living alone</b>						
Yes	29,360	21.8	29,360	42.5	0	0.0
No	4,885	3.6	4,885	7.1	0	0.0
Long-term-care facility	65,351	48.6	0	0.0	65,351	100.0
Unknown	34,882	26.0	34,882	50.5	0	0.0
<b>Smoking (include ex-smoker)</b>						
Yes	8,575	6.4	6,057	8.8	2,518	3.9
No	125,901	93.6	63,070	91.2	62,831	96.1
Unknown	2	0.0	0	0.0	2	0.0
<b>Underlying disease</b>						
Yes	55,433	41.2	29,961	43.3	25,472	39.0
No	79,045	58.8	39,166	56.7	39,879	61.0
<b>Active daily living</b>						
Normal	67,190	50.0	48,902	70.7	18,288	28.0
Physically disabled	49,929	37.1	18,981	27.5	30,948	47.4
Bed-ridden	17,359	12.9	1,244	1.8	16,115	24.6
<b>TB symptoms (Cough over 2 weeks and other symptoms)</b>						
Yes	14,225	10.6	9,442	13.7	4,783	7.3
No	120,253	89.4	59,685	86.3	60,568	92.7
<b>TB History</b>						
Yes	2,816	2.1	1,956	2.8	860	1.3
No	117,466	87.3	60,276	87.2	57,190	87.5
Unknown	14,196	10.6	6,895	10.0	7,301	11.2
<b>History of TB within the family</b>						
Yes	1,348	1.0	627	0.9	721	1.1
No	112,783	83.9	60,966	88.2	51,817	79.3
Unknown	20,347	15.1	7,534	10.9	12,813	19.6
<b>Priority of examination</b>						
<b>Priority examination target</b>						
Elderly with medical care	87,105	64.8	39,206	56.7	47,899	73.3
Elderly with Bed-ridden at home (include Physically disabled)	15,905	11.9	8,259	11.9	7,646	11.7
Second priority examination target	71,200	52.9	30,947	44.8	40,253	61.6
Living alone	47,373	35.2	29,921	43.3	17,452	26.7
Near poverty groups	11,187	8.3	11,187	16.2	0	0.0
Weak elderly	7,195	5.4	1,430	2.1	5,765	8.8
Residents and workers of facilities under the age of 65	2,147	1.6	1,742	2.5	405	0.6
Etc*	14,300	10.6	6,367	9.2	7,933	12.1
	12,544	9.3	9,195	13.3	3,349	5.1

\* 65 years of age or older National health insurance · Health vulnerable group, Community Residents under the age of 65, etc.

Table 2. Characteristics of tuberculosis (TB) patients

Variables	TB patients			
	n	%	Incidence rate (per 100,000 people)	p-value
<b>Total</b>	98	100.0	72.9	
<b>Sex</b>				<0.001
Male	45	45.9	137.0	
Female	53	54.1	52.2	
<b>Age</b>				<0.001
≤ 64	0	0.0	0.0	
65-69	2	2.0	25.9	
70-74	4	4.1	32.3	
75-79	20	20.4	95.7	
≥ 80	72	73.5	92.5	
<b>BMI (Kg/m<sup>2</sup>)</b>				0.032
Under weight(<18.5)	12	12.2	70.1	
Normal weight(18.5-22.9)	60	61.2	94.1	
Over weight(23.0-24.9)	18	18.4	65.3	
Obese(≥25.0)	8	8.2	30.7	
Unknown	0	0.0	0.0	
<b>Area</b>				0.164
Seoul	13	13.3	93.8	
Busan	5	5.1	50.3	
Daegu	5	5.1	57.4	
Incheon	3	3.0	40.6	
Gwangju	9	9.2	198.1	
Daejeon	5	5.1	99.3	
Ulsan	3	3.1	151.0	
Sejong	1	1.0	136.6	
Gyeonggi	10	10.2	59.4	
Gangwon	7	7.1	103.2	
Chungbuk	4	4.1	63.9	
Chungnam	10	10.2	98.1	
Jeonbuk	3	3.1	28.2	
Jeonnam	5	5.1	28.2	
Jeonnam	5	5.1	56.2	
Gyeongbuk	8	8.2	79.6	
Gyeongnam	5	5.1	51.6	
Jeju	2	2.0	67.9	
<b>Type of insurance</b>				0.450
National health insurance (work, district)	78	79.6	72.5	
Medical care (type1, 2)	16	16.3	67.1	
None	4	4.1	132.8	
<b>Residence type</b>				0.418
Long-term-care facility	43	43.9	65.8	
Community	55	56.1	79.6	

Table 2. (Continued) Characteristics of tuberculosis (TB) patients

Variables	TB patients			
	n	%	Incidence rate (per 100,000 people)	p-value
<b>Living alone</b>				0.227
Yes	28	28.5	95.4	
No	1	1.0	20.5	
Long-term-care facility	43	43.9	65.8	
Unknown	26	26.5	74.5	
<b>Smoking (include ex-smoker)</b>				0.145
Yes	11	11.2	128.3	
No	87	88.8	69.1	
Unknown	0	0.0	0.0	
<b>Underlying disease</b>				0.129
Yes	33	33.7	59.5	
No	65	66.3	82.2	
<b>Active daily living</b>				0.196
Normal	57	58.1	84.8	
Physically disabled	28	28.6	56.1	
Bed-ridden	13	13.3	74.9	
<b>TB symptoms (Cough over 2 weeks and other symptoms)</b>				<0.001
Yes	30	30.6	210.9	
No	68	69.4	56.5	
<b>TB History</b>				0.310
Yes	2	2.0	71.0	
No	81	82.7	69.0	
Unknown	15	15.3	105.7	
<b>History of TB within the family</b>				0.278
Yes	2	2.0	148.4	
No	77	78.6	68.3	
Unknown	19	19.4	93.4	
<b>Priority of examination</b>				0.170
<b>Priority examination target</b>	70	71.4	80.4	
Elderly with medical care	11	11.2	69.2	
Elderly bed-ridden at home(include Physically disabled)	59	60.2	82.9	
<b>Second priority examination target</b>	28	28.6	59.1	
Living alone	10	10.2	89.4	
Near poverty groups	5	5.1	69.5	
Weak elderly	1	1.1	46.6	
Residents and workers of facilities under the age of 65	0	0.0	0.0	
Etc*	12	12.2	95.7	

\* 65 years of age or older National health insurance · health vulnerable group, community residents under the age of 65, etc.

Table 3. Clinical characteristics of tuberculosis (TB) patients diagnosed in the screening

Variables	Participants		TB patients	
	n	%	n	%
<b>Total</b>	<b>134,478</b>	<b>100.0</b>	<b>98</b>	<b>100.0</b>
<b>Chest x-ray</b>				
<b>Subtotal</b>	<b>134,467</b>	<b>100.0</b>	<b>98</b>	<b>100.0</b>
Normal	86,742	64.5	4	4.1
Need treatment*	173	0.1	7	7.2
Observation required†	1,972	1.5	24	24.5
Inactive TB‡	10,710	8.0	51	52.0
Other diseases suspected	34,870	25.9	12	12.2
<b>Sputum smear</b>				
<b>Subtotal</b>	<b>17,647</b>	<b>100.0</b>	<b>98</b>	<b>100.0</b>
Positive	133	0.8	63	64.3
Negative	17,514	99.2	35	35.7
<b>Sputum culture</b>				
<b>Subtotal</b>	<b>17,643</b>	<b>100.0</b>	<b>98</b>	<b>100.0</b>
Positive	91	0.5	89	90.8
Negative	16,711	94.7	5	5.1
NTM§	841	4.8	4	4.1
<b>TB-PCR test¶</b>				
<b>Subtotal</b>	<b>17,641</b>	<b>100.0</b>	<b>98</b>	<b>100.0</b>
Positive	33	0.2	33	33.7
Negative	17,499	99.2	62	63.3
NTM§	104	0.6	1	1.0
Contamination	5	0.0	0	0.0
Not done	0	0	2	2.0
<b>Drug sensitivity test</b>				
<b>Subtotal</b>	<b>—</b>	<b>—</b>	<b>98</b>	<b>100.0</b>
Rifampin(R) Drug Resistance	—	—	1	1.0
Isoniazid(H) Drug Resistance	—	—	6	6.1
Drug sensitivity	—	—	77	78.6
Etc	—	—	6	6.1
Inspection error	—	—	8	8.2

\* 'Active pulmonary tuberculosis' or 'exudation pleural effusion' which is presumed to be tuberculosis, suggesting the treatment of tuberculosis, sputum examination for confirmation

† Any suspicion of 'active tuberculosis' or 'suspected tuberculosis', the final diagnosis of the doctor is necessary, including the additional tuberculosis test including sputum examination and the clinical findings of the patient in public health centers and medical institutions

‡ Pulmonary tuberculosis developed in the past but remained healed and traces of fibrotic changes remain

§ Means anti-bacterial bacteria except tuberculosis and leprosy, and diseases caused by non-tuberculosis antibacterial bacteria are classified as characteristic clinical syndromes such as lung disease, lymphadenitis, skin, soft tissue, bone infection, and disseminated disease.

¶ M. tuberculosis-polymerase chain reaction (TB-PCR)

**Table 4.** Clinical characteristics of Inactive tuberculosis (TB) patients diagnosed in the screening

Variables	Inactive TB patients	
	n	%
<b>Total</b>	51	100
<b>Sex</b>		
Male	27	52.9
Female	24	47.1
<b>Age</b>		
≤ 64	—	—
65–69	1	2.0
70–74	1	2.0
75–79	11	21.5
≥ 80	38	74.5
<b>BMI (kg/m<sup>2</sup>)</b>		
Under weight (<18.5)	7	13.7
Normal weight (18.5–22.9)	34	66.7
Over weight (23.0–24.9)	10	19.6
Obese (≥25.0)	0	0.0
<b>Health Insurance</b>		
National health insurance (work, district)	41	80.4
Medical care (type1, 2)	6	11.8
Unknown	4	7.8
<b>Residence type</b>		
Long-term care facility	19	37.3
Community	32	62.7
<b>Living alone</b>		
Yes	14	27.5
No	1	2.0
Long-term-care facility	19	37.3
Unknown	17	33.3
<b>Smoking (include ex-smoker)</b>		
Yes	8	15.7
No	43	84.3
<b>Active daily living</b>		
Normal	31	60.8
Physically disabled	15	29.4
Bed-ridden	5	9.8



**Table 4.** (Continued) Clinical characteristics of Inactive tuberculosis (TB) patients diagnosed in the screening

Variables	Inactive TB patients	
	n	%
<b>TB symptoms</b> (Cough over 2 weeks and other symptoms)		
Yes	7	13.7
No	44	86.3
<b>TB history</b>		
Yes	1	2.0
No	37	72.5
Unknown	13	25.5
<b>History of TB within the family</b>		
Yes	1	2.0
No	38	74.5
Unknown	12	23.5
<b>Underlying disease</b>		
Yes	32	62.7
No	19	37.3
<b>Sputum smear</b>		
Positive	15	29.4
Negative	36	70.6
<b>Sputum culture</b>		
Positive	48	94.1
Negative	3	5.9
<b>TB-PCR test</b>		
Positive	14	27.5
Negative	36	70.6
Not done	1	1.9
<b>Drug sensitivity test</b>		
Drug resistance	5	9.8
Drug sensitivity	40	78.4
Not done	6	11.8