



Drug Resistant of *Mycobacterium tuberculosis* in Taiwan, 2003-2005

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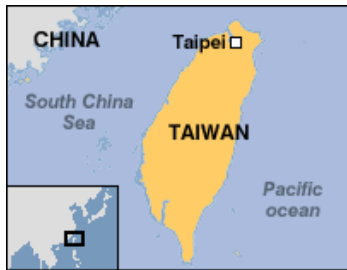
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Outlines

- Tuberculosis burden and epidemiology
- Drug resistant surveillance program
 - Hospital based surveys, 1964-2002
 - Laboratory-based surveillance system, 2003-2005
- DOTS and DOTS-plus program





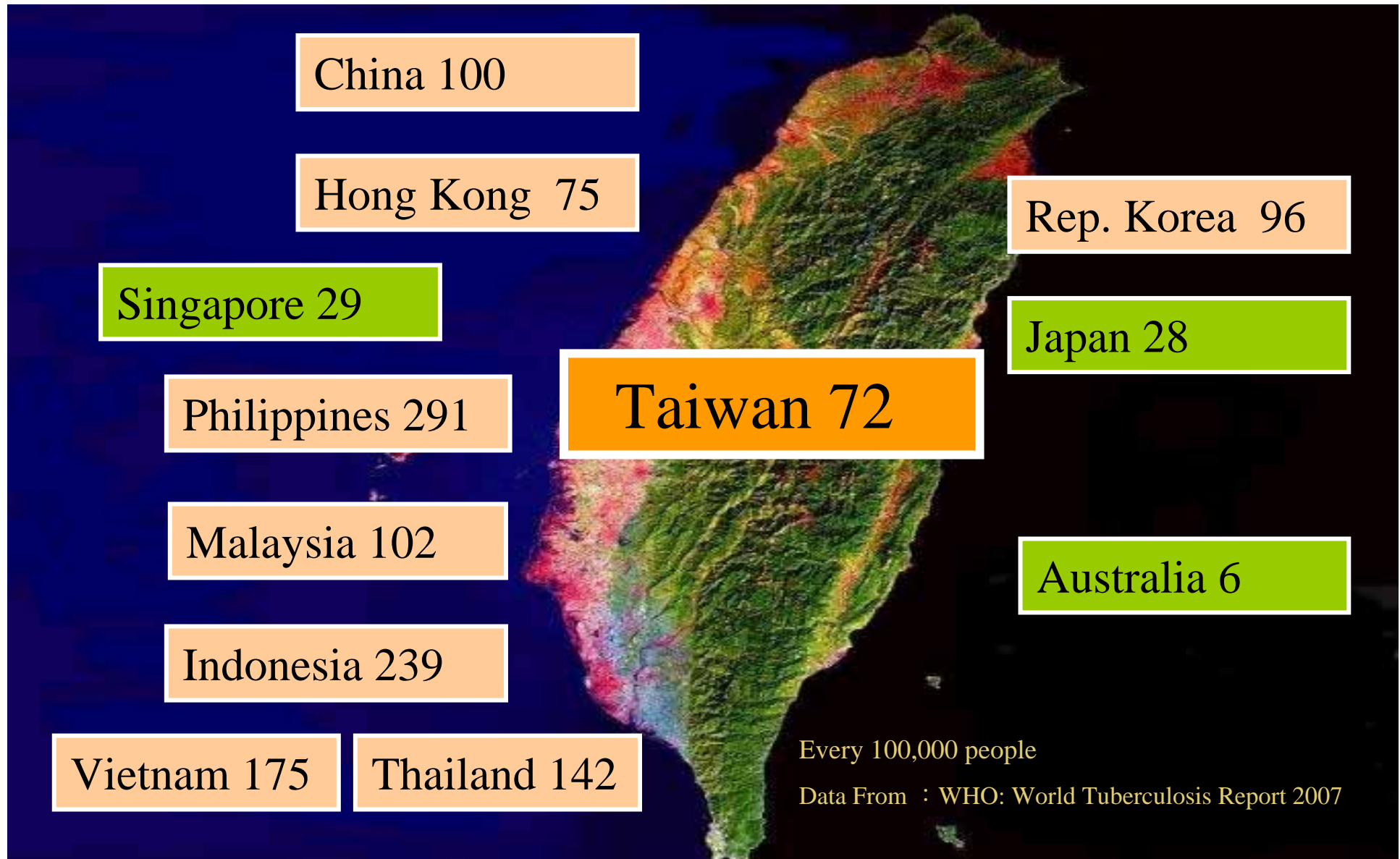
General Information, Taiwan



- Area: 36,188km²
- Climate: subtropical
- Population, 2005: 22.7 millions
 - under 15 : 18.70%
 - 15-64 : 71.56%
 - 65 and over: 9.74%
- Life expectancy, 2005
 - Male : 73.72
 - Female : 79.79
- Per Capita GDP : 15,291
- Medical expenditure as % of GDP : 6.16

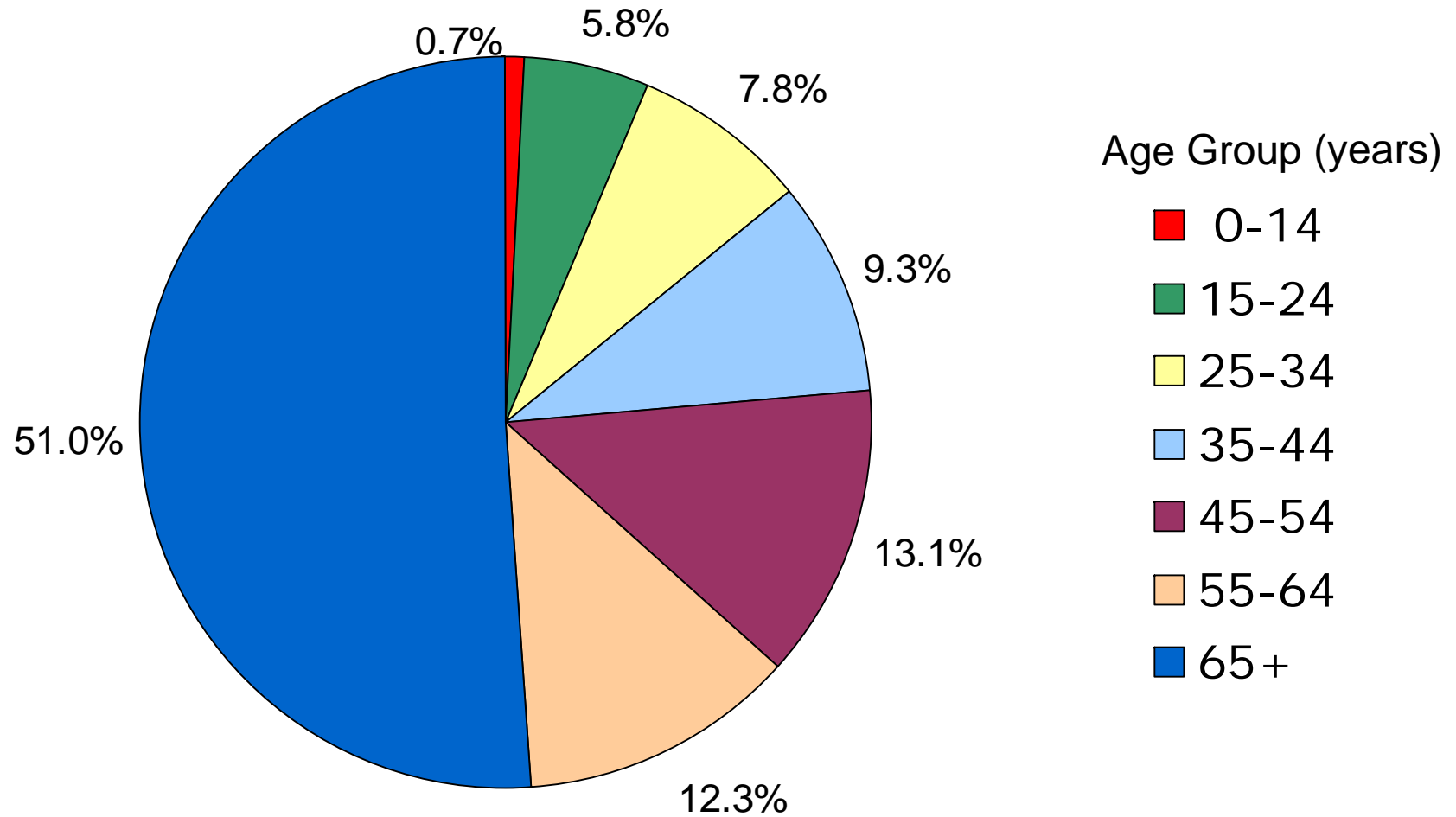
Source: Ministry of Interior

TB Incidence in Asia-Pacific Countries, 2005





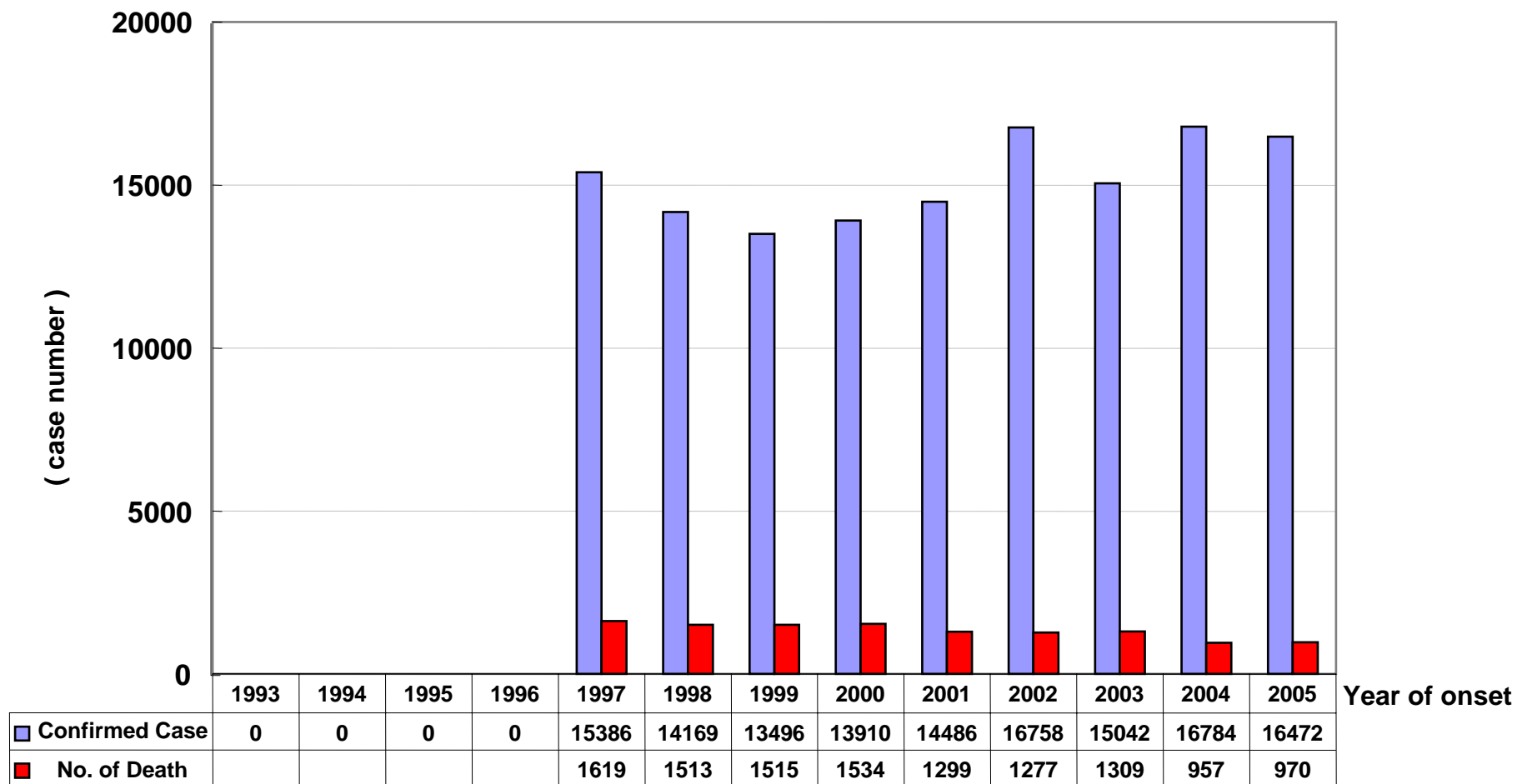
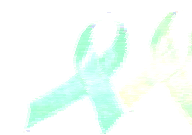
TB Cases by Age Group Taiwan, 2005



Note: 51% TB cases is above 65 years old.



TB Burden in Taiwan





TB Drug Resistance Surveillance



Definition of Drug Resistance



- **primary drug resistance**
 - Resistance among new cases
- **acquired drug resistance**
 - Resistance among previously treated cases
- **Combined drug resistance**
 - Primary and acquired drug resistance
- **Multiple drug resistance**
 - Resistant to at least INH and RMP



Tuberculosis Chemotherapy

Taiwan Guidelines for TB Diagnosis & Treatment (Second Edition)

first line anti-tuberculosis drug

- Isoniazid, INH
 - Ethambutol, EMB
 - Rifampicin, RMP
 - Pyrazinamide, PZA
 - Streptomycin, SM
- NEW
- Retreatment S(+)





Timeline of Anti-TB Chemotherapy in Taiwan

- 1957 INH alone
- 1958 Combination therapy
INH+SM+PAS (Thiacetazone, EMB)
- 1978 Rifampin added regimens
5HER/5H, 5HER/3HER/2H, 5HER/5HER
- 1990 Short-course chemotherapy (6 months)
2HERZ/4HER
- 1993 Short-course chemotherapy (6 months)
Fixed-dose combinations (Rifater/Rifinah)



Primary Drug Resistance

Hospital*	No. of strains	Study period	Drug resistance§ (%)						Methods
			INH	EMB	RMP	SM	Any	MDR	
A†	162	1960-1962	13.4	-	-	11.7	22.2	-	Absolute concentration
B‡	154	1962	8.4	-	-	7.8	14.3	-	
B‡	557	1971-1972	22.6	-	-	15.4	30.8	-	Resistance ratio on SM; Absolute concentration on INH and EMB
B‡	1,914	1979-1982	8.4	0.1	0	9.2	17.9	-	Absolute concentration
B‡	1,924	1984-1988	6.8	0.4	<u>0.2</u>	5.0	9.9	-	Resistance ratio (1984-1986); Absolute concentration (1986-1988)
B‡	1,935	1990-1995	9.2	0.7	1.5	5.7	8.7	1.2	Absolute concentration
B‡	249	1996	12.0	0.8	2.0	4.8	16.1	1.6	Absolute concentration
C‡	254	1996-1999	4.7	5.9	5.9	11.0	22.0	1.6	Proportion
D†	456	2001-2002	14.9	2.6	3.3	11.4	20.6	2.4	BACTEC 960
E†	190	2001-2002	11.1	5.8	2.1	5.3	16.8	2.1	Proportion
F‡	611	2002-2004	6.8	0.8	1.8	6.2	12.8	1.8	Proportion

*A (Taipei Veteran General Hospital), B (Taiwan Provincial Chronic Disease Control Bureau), C (Taipei Municipal Chronic Disease Hospital), D (Changhua Christian Hospital), E (Buddhist Tzu Chi General Hospital), F (Chest Hospital)

†medical center

‡referral TB center

§INH: isoniazid; EMB: ethambutol; RMP: rifampin; SM: streptomycin; Any: resistance to any one of INH, EMB, RMP, and SM; MDR: resistance to at least INH and RMP

Global Report (median) 5.9 0.8 1.4 6.3 10.2 1.1
1999-2002



Acquired Drug Resistance

Hospital*	No. of strains	Study period	Drug resistance§ (%)						Methods
			INH	EMB	RMP	SM	Any	MDR	
B‡	200	1996	63.0	28.5	46.5	21.5	67.0	46.0	Absolute concentration
C‡	199	1996-1999	25.6	11.1	32.2	17.1	49.2	15.1	Proportion
D†	57	2001-2002	31.6	15.8	17.5	19.3	36.8	15.8	BACTEC 960
E†	62	2001-2002	54.8	33.9	45.2	17.7	64.5	45.2	Proportion
B‡	183	2001-2002	37.7	10.9	25.1	17.5	42.6	24.6	Absolute concentration
F‡	324	2002-2004	50.9	12.6	44.4	17.9	55.8	42.2	Proportion

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Global Report (median) 14.4 3.5 8.7 11.4 18.4 7.0
1999-2002



Combined Drug Resistance

Hospital*	No. of strains	Study period	Drug resistance§ (%)						Methods
			INH	EMB	RMP	SM	Any	MDR	
G†	942	1982-1986	20.4	15.3	8.8	9.8	27.8	8.1	Proportion
A†	651	1990-1992	14.2	10.3	10.6	11.2	22.6	8.3	Proportion
G†	884	1992-1996	20.9	12.8	11.8	9.1	28.9	10.1	Proportion
B‡	1,091	1996	31.5	11.4	18.2	11.9	<u>35.5</u>	<u>17.3</u>	Absolute concentration
C‡	453	1996-1999	13.9	8.2	17.4	13.7	33.3	7.5	Proportion
H†	693	1996-2000	35.9	15.7	13.4	28.6	52.4	11.4	Proportion
I†	1,411	1998-2002	19.0	15.7	6.1	10.0	30.5	5.1	Proportion
D†	513	2001-2002	16.8	4.1	4.9	12.3	22.4	3.9	BACTEC 960
E†	252	2001-2002	21.8	12.7	12.7	8.3	28.6	12.8	Proportion
F‡	935	2002-2004	22.2	5.2	16.5	10.2	<u>27.6</u>	<u>15.8</u>	Absolute concentration
C‡	1,848	2004	8.1	1.2	6.9	11.4	18.2	4.1	Proportion

*A (Taipei Veteran General Hospital), B (Taiwan Provincial Chronic Disease Control Bureau), C (Taipei Municipal Chronic Disease Hospital), D (Changhua Christian Hospital), E (Buddhist Tzu Chi General Hospital), F (Chest Hospital), G (Chang-Gung Memorial Hospital), H (Kaohsiung Medical University Hospital), I (National Taiwan University Hospital)

†medical center

‡referral TB center

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Laboratory Surveillance System in Taiwan

Taipei Municipal Chronic Disease Hospital, Taipei municipal WanFang Hospital and Linkou Chang-Gung Memorial Hospital

Northern

Central

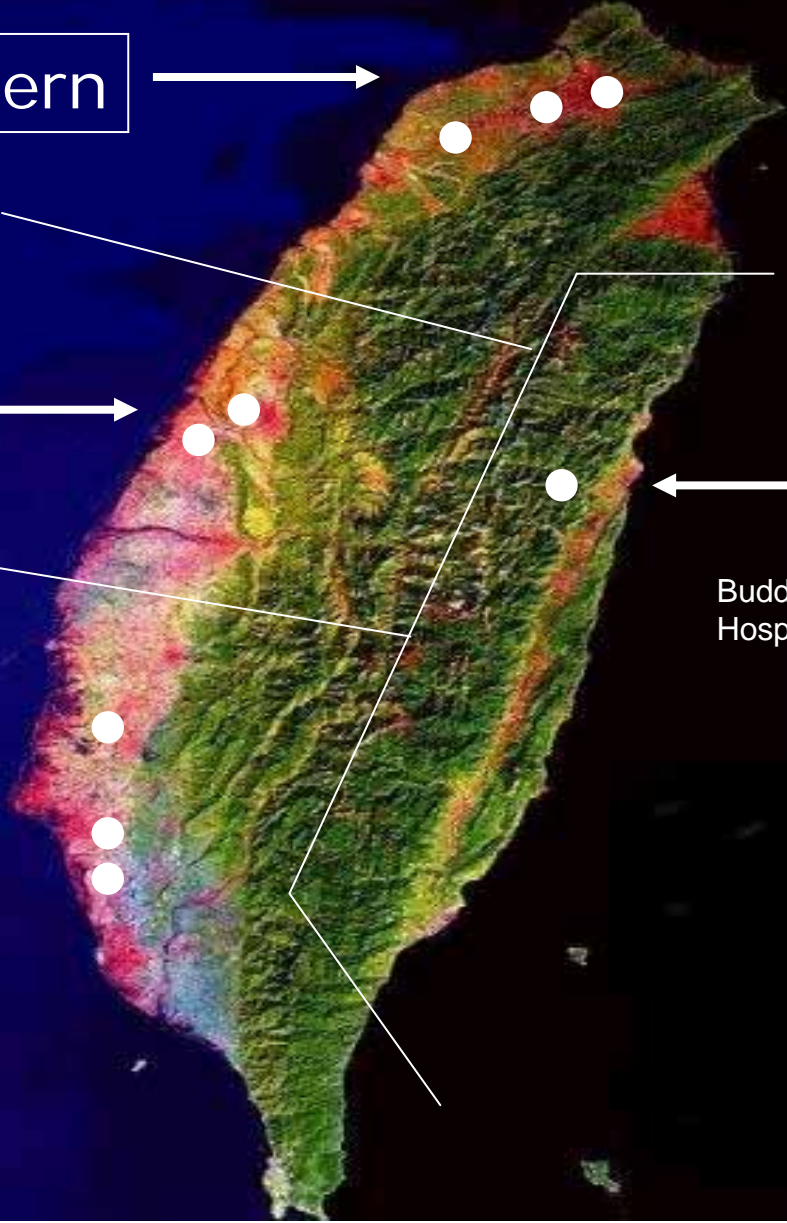
Chung Shan Medical University Hospital and Taichung Hospital, Department of Health

Southern

Chest Hospital, Kaohsiung Chang-Gung Memorial Hospital, Kaohsiung Veteran General Hospital, and Kaohsiung Medical University Hospital

Eastern

Buddhist Tzu Chi General Hospital





Taiwan Surveillance of Drug Resistance in Tuberculosis (TSDRTB), 2003

- Population in 2003: 22,562,663
- Confirmed TB cases: 15,042
- Incidence rate: 66.7/100,000
- New sputum positive rate: 34.6%
- Number of strains analyzed: 3,699
- DST methods: agar proportion, liquid system
- EQA system: CAP (contract & NRL) & Belgium (NRL)



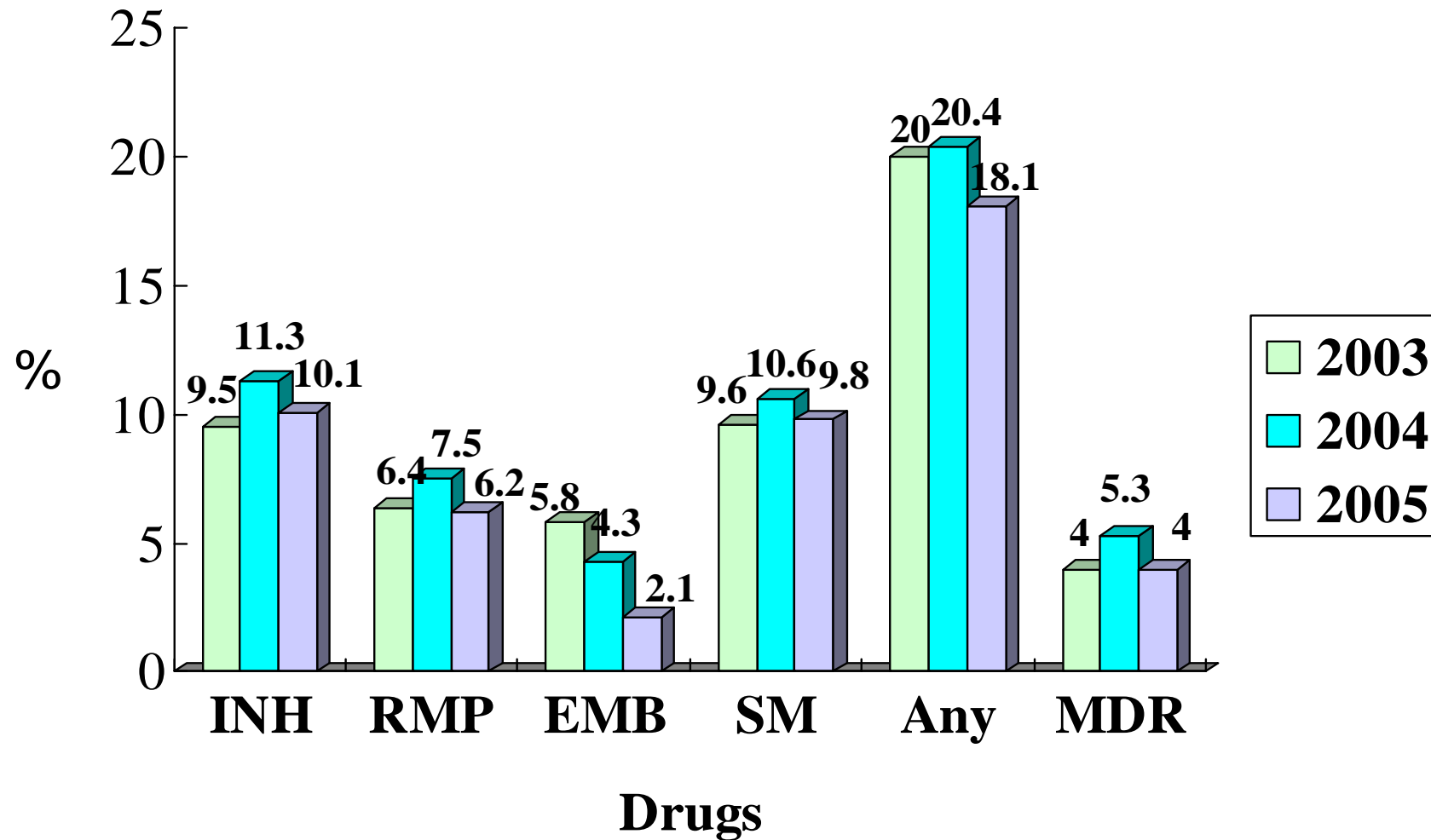
Taiwan Surveillance of Drug Resistance in Tuberculosis (TSDRTB), 2003-5

	2003	2004	2005
Population	22,562,663	22,689,122	22,770,383
Confirmed TB cases	15,042	16,784	16,472
Incidence rate (100,000)	66.7	74.11	72.47
New sputum positive rate (%)	34.6	<u>35.0*</u>	35.0
Number of strains analyzed	3,699	3,885	4,219

*estimated



Combined Drug Resistance, 2003-5



Global Report
(median) (%)
1999-2002

6.6

2.2

1.3

6.1

10.4

1.7



DOTS and DOTS-Plus Program in Taiwan

- DOTS
 - Implemented from **April, 2006** for smear positive TB cases
 - Carried by public health nurses, hospital health care workers, 400 DOTS outreach workers
 - Cover **90.5%** of smear positive TB cases in July, 2007
- DOTS-Plus
 - Implemented from **May, 2007** for MDR TB cases
 - Cared by DOTS-Plus medical care system



Thank You for Your Attention

