2017-4-15

LTBI Treatment for IGRA-positive Healthcare Workers: Pro

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표 1. 의료기관 종사자 잠복결핵감염 검진 - 권고 수준 및 시기

* 초회 검진은 모든 의료기관 종사자에서 1회 실시
* 주기적 검진은 대상군별 권고 수준 및 시기에 따름

구분[1]	해당 부서 예시[2]	초회 검진	주기적 검진
1군. 결핵환자를 검진·치료·진단하는 의료인 및 의료기사 등 호흡기결핵환자와 접촉 가능성이 높은 종사자	• 호흡기내과 외래·병동, 기관지내시경실, 결핵균검사실, 폐기능검사실 등 • 감염내과 외래·병동, 내과중환자실, 응급실 등 • 소아호흡기알레르기 클리닉 등 • 흉부영상 촬영 부서	실시	실시
2군. 면역이 약하여 결핵발병시 중증결핵 위험이 높은 환자와 접촉하는 종사자 신생아, 면역저하자 등 결핵균 감염 시 중증 결핵 발병 고위험군과 접촉 가능성이 높은 종사자	• 신생아실, 신생아중환자실 등 • 1·2차 분만의료기관, 조산원 등 • 장기이식병동, 혈액암병동, 투석실, HIV 관련 부서 등	실시	실시
3군. 그 밖에 호흡기 감염이 우려되는 의료기관 종사자 호흡기결핵환자와 접촉 가능성이 비교적 낮은 종사자	1군 또는 2군에 해당하지 않는 임상과 의료인 및 의원급 의료기관 등	실시	권고
4군. 기타 의료기관 종사자 그 밖의 결핵감염 위험도가 낮은 종사자	환자와의 접촉 가능성이 낮은 사무직 종사자 등	실시	해당 없음

의료기관 결핵관리 안내

2016년 8월 (2차 개정판)

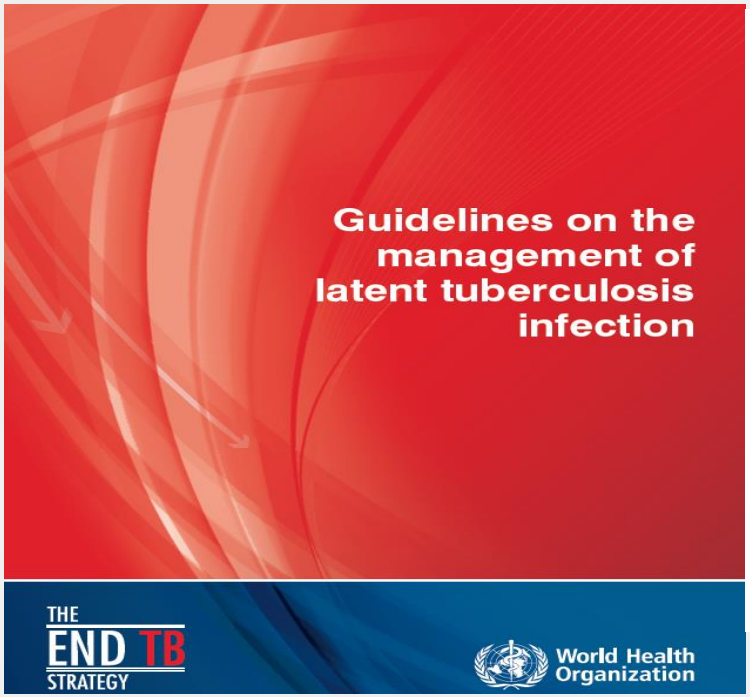
질병관리본부
KOREA CENTERS FOR DISEASE CONTROL & PREVENTION

○ (잠복결핵감염 치료)

- (치료 실시)
  - (주기적 검사에서) TST 또는 IGRA에서 **양전*이 확인된 경우**, 또는
  - **최근 2년 내 결핵환자와 접촉력****이 있으면서 잠복결핵검사가 2년 내에 양전된 경우, 또는
  - **2군 대상자**(중증결핵 고위험군과 접촉하는 종사자)**에서 잠복결핵감염 양성**인 경우

> * IGRA 검사의 경우 **양전**(positive conversion)의 개념이 확립되어 있지 않으므로 결핵전문가의 소견 등을 참고하여 의료기관별로 정하는 기준에 따름
> ** '**접촉력**'은 결핵역학조사의 기준을 준용하여, 밀폐된 좁은 공간 접촉을 전제로 개인보호장구를 착용하지 않은 상태로 '하루에 연속으로(또는 매일) 8시간 이상 접촉한 경우', 또는 '누적기준으로 40시간 이상 접촉한 경우'를 의미함 (단, 현장조사 결과 등에 따라 기준시간 이하도 포함 가능)

- (치료 권고)
  - 과거 결핵 치료력 없이 '**자연 치유된 결핵 병변**'에 해당하는 경우
  - 이상에 해당하지 않는 잠복결핵감염 검사 **양성자** (기관에 따라 치료 고려)
- (경과 관찰)
  - 잠복결핵감염 치료 대상이나 간독성의 위험성이 큰 경우에는 위험, 이익을 고려하여 치료하지 않고 경과를 관찰할 수 있음
  - 경과를 관찰하는 경우 최소 2년 간 경과관찰을 요함



PERSPECTIVE TUBERCULOSIS

CrossMark

Management of latent *Mycobacterium tuberculosis* infection: WHO guidelines for low tuberculosis burden countries

…these guidelines are primarily targeted to high income or upper middle income countries with an estimated TB incidence rate of less than 100 per 100000 population per year. The panel judged that these countries were most likely to benefit from programmatic management of LTBI due to their current TB epidemiology and resource availability.

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WHO 2015

EUR	AMR	WPR	EMR
Albania	Antigua and Barbuda	American Samoa	Bahrain
Andorra	Argentina	Australia	Iran (Islamic Republic of)
Austria	Aruba	Brunei Darussalam	Iraq
Azerbaijan	Bahamas	China	Jordan
Belarus	Barbados	China, Hong Kong SAR	Kuwait
Belgium	Belize	China, Macao SAR	Lebanon
Bosnia and Herzegovina	Bermuda	Fiji	Libya
Bulgaria	Brazil	French Polynesia	Oman
Croatia	Canada	Guam	Qatar
Cyprus	Cayman Islands	Japan	Saudi Arabia
Czech Republic	Chile	Korea, Republic of	Tunisia
Denmark	Colombia	Malaysia	United Arab Emirates
Estonia	Costa Rica	New Caledonia	
Finland	Cuba	New Zealand	

-TB contact
-Anti-TNF Tx
-Dialysis Pts
-SOT, HSCT
-Silicosis

- Should be performed

-HCWs
-Immingrant from high TB
-Homeless
-Ilicit drug user

- Should be considered

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Eur Respir J 2015; 46:1563–1576

The Panel concluded that the evidence of benefits outweighing harms in the following population risk groups is weak, but **judged that the benefits of systematic testing and treating may outweigh the harms**: **health-care workers**, immigrants from high TB burden countries, prisoners, homeless persons and illicit drug users. The decision to systematically test for and treat LTBI in these population groups should be in **accordance with local TB epidemiology and context, health system structures, availability of resources and overall health priorities**

Incidence of active TB

Study		Type of Study	Incid	Annual Incidence: Workers	Annual Incidence: General Population*
	Chicago			140	70
	California			3800	—
Geiseler et al.[18]	Hong Kong	Questionnaire	Annı	393	413
Barrett-Connor[19]	Ontario	Questionnaire	Cum	33	25
Kwan et al.[17]	British Columbia	Cohort	Direc	26	11
Ashley and Wigle[2]	Britain	Registry	Repc		
Burrill et al.[21]		Registry	Repc	110	21
Harrington and Shannon[22]	Scotland	Questionnaire	Self-		
Capewell et al.[23]		Registry	Repc	11	20
Grist and Emslie[24] and Grist[25]	Britain	Questionnaire	Self-	27	15–20
Lunn and Mayho[26]	England and Wales	Registry	Repc		
Loughrey et al.[27]		Registry	Repc	0.6–1.0†	
Price et al.[28]	Ireland	Registry	Repc	1.25†	
Sugita et al.[29]	North Carolina	Questionnaire	Cum	9.4	12.6
	Japan			6–11 ‡	

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Menzies et al. NEJM 199 Jun 12;332(2):92-8.

TB risk in HCWs

Table 2. Incidence of TB among HCWs in Medical Center A from 2006 to 2012.

Year	Incident TB cases in certified HCWs at Medical Center A[a]	Number of certified HCWs at Medical Center A	Incidence at Medical Center A (per 100,000 person-year)	SIR[b] (95% CI
2004	5	N/A	-	-
2005	5	N/A	-	-
2006	6	4,225	142.0	3.11
2007	2	4,325	46.2	1.13
2008	2	4,851	41.2	1.13
2009	5	5,031	99.4	3.16
2010	3	5,172	58.0	1.92
2011	2	5,449	36.7	1.49
2012	2	5,807	34.4	1.37
Average[c]			63.1	1.93 (1.21–2.9

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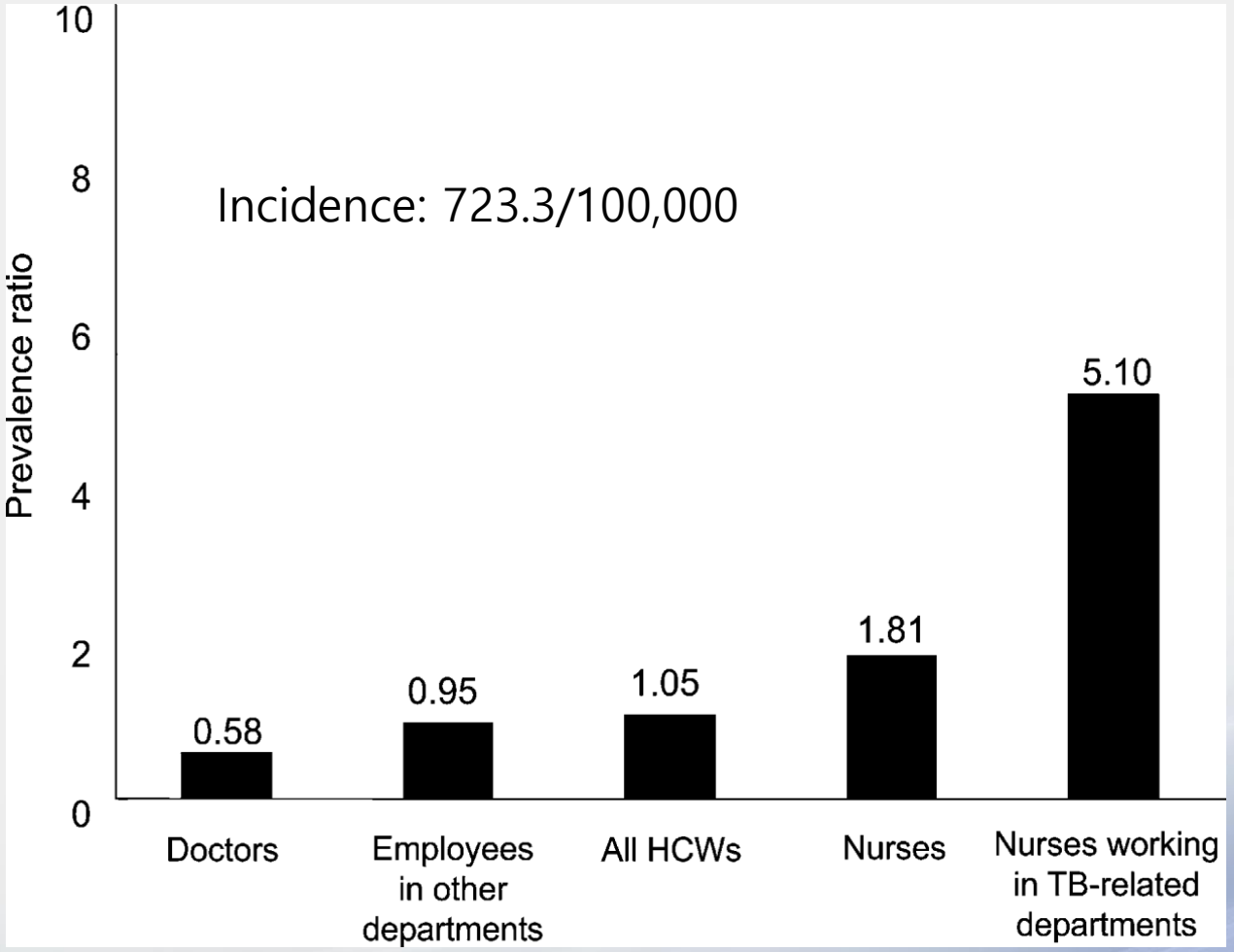
Pan SC et al. PLoS ONE 2015;10(12): e0145047. doi:10.1371/

TB risk in HCWs in Korea



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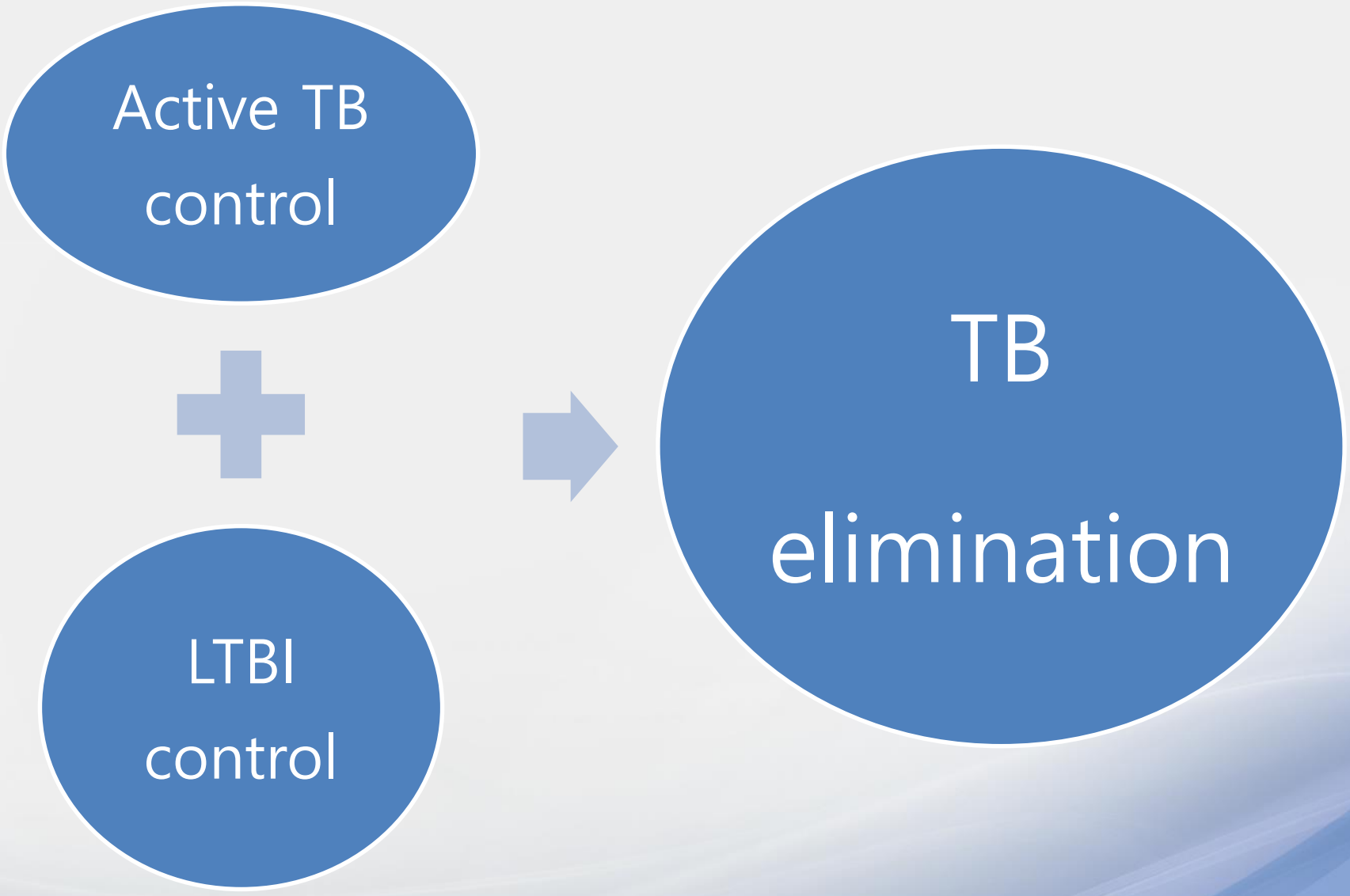
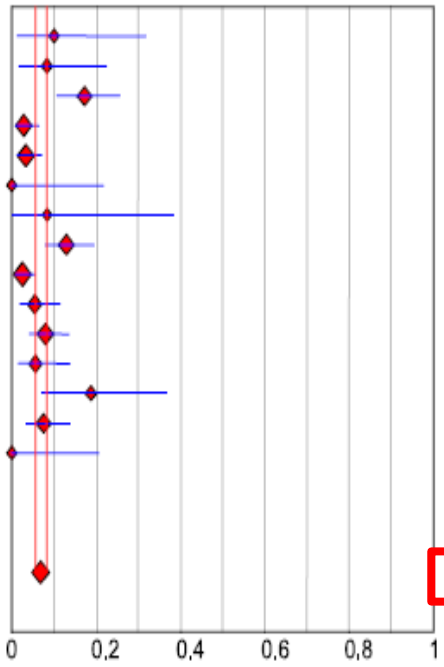
Jo KW et al. Int J Tuber Lung Dis 2008; 12:436-40


Active TB control
LTBI control
TB elimination

LTBI Dx and Tx

- **To Whom?**
- **Which test** for LTBI is better ?

Positive predictive value- high risk group



	PPV	(95% CI)	n/N
Clark 2007[36]	0.10	(0.01 – 0.32)	2/20
Aichelburg 2009[24]	0,08	(0,02 – 0,22)	3/36
Haldar 2009[25]	0.17	(0.11 – 0.26)	19/110
Kik 2009[14]	0,03	(0,01 – 0,06)	5/178
Kik 2009[14]	0,03	(0,01 – 0,07)	6/181
Lee 2009[13]	0.00	(0.00 – 0.22)	0/15
Lee 2009[13]	0,08	(0,00 – 0,38)	1/12
Diel 2011[27]	0.13	(0.08 – 0.19)	19/147
Harstad 2010[28]	0,03	(0,01 – 0,05)	6/238
Jonnalaggada 2010[37]	0,05	(0,02 – 0,11)	6/110
Leung 2010[38]	0.08	(0.04 – 0.13)	12/151
Kim 2011[39]	0,06	(0,02 – 0,14)	4/71
Song 2011[34]	0,19	(0,07 – 0,36)	6/32
Yoshiyama 2011[22]	0.08	(0.04 – 0.14)	9/119
Zhang 2011[40]	0.00	(0.00 – 0.21)	0/16

Pooled PPV for progression = 0.068 (0.056 to 0.083)
Chi-square = 50,30; df = 14 (p = 0,0000)
Inconsistency (I-square) = 72,2 %

PPV for progression commercial IGRAs

IGRA

TST

	PPV	(95% CI)	n/N
Higuchi 2007[20]	0.00	(0.00 – 0.04)	0/95
Bakir 2008[16]	0,04	(0,01 – 0,10)	3/83
Hill 2008[17]	0.02	(0.01 – 0.03)	14/843
Lee 2009[13]	0,05	(0,00 – 0,25)	1/20
Higuchi 2009[21]	0.00	(0.00 – 0.03)	0/200
Kik 2009[14]	0,03	(0,01 – 0,05)	8/288
Diel 2011[27]	0,03	(0,02 – 0,05)	17/555
Harstad 2010[28]	0.01	(0.01 – 0.03)	6/415
Leung 2010[38]	0,07	(0,03 – 0,12)	9/136
Song 2011[34]	0.06	(0.02 – 0.13)	6/99
Chang 2011[30]	0.00	(0.00 – 0.21)	0/16
Lienhardt 2010[19]	0.03	(0.01 – 0.04)	16/629
Silvermann 2007[23]	0.00	(0.00 – 0.26)	0/12

Pooled PPV for progression = 0.024 (0.019 to 0.029)
Chi-square = 32.87; df = 12 (p = 0.0010)
Inconsistency (I-square) = 63,5 %

PPV for progression TST

Diel R et al. **CHEST 2012; 142(1):63–75**

		One-step TST						Two-step TST
		≥10 (mm)*			≥11 (mm)*	≥13 (mm)*	≥15 (mm)*	≥10 (mm)*
			BCG (−)**	BCG (+)**				
TST+/IGRA+ (n)		114	44	39	102	86	69	119
TST+/IGRA- (n)		49	14	27	30	21	13	58
TST-/IGRA+ (n)		21	8	8	33	49	66	16
TST-/IGRA- (n)		71	33	23	90	99	107	62
Agreement, %		72.5	77.8	63.9	75.3	72.5	69.0	71.0
Kappa (SE)		0.44 (0.06)	0.55 (0.10)	0.29 (0.09)	0.50 (0.06)	0.46 (0.06)	0.39 (0.06)	0.41 (0.06)
Symmetry test***	Chi-squared value	11.2	1.64	10.3	0.14	11.2	35.6	23.8
	p value	0.0008	0.20	0.0013	0.71	0.0008	<0.0001	<0.0001

Vietnamm
2007 HCWs 300

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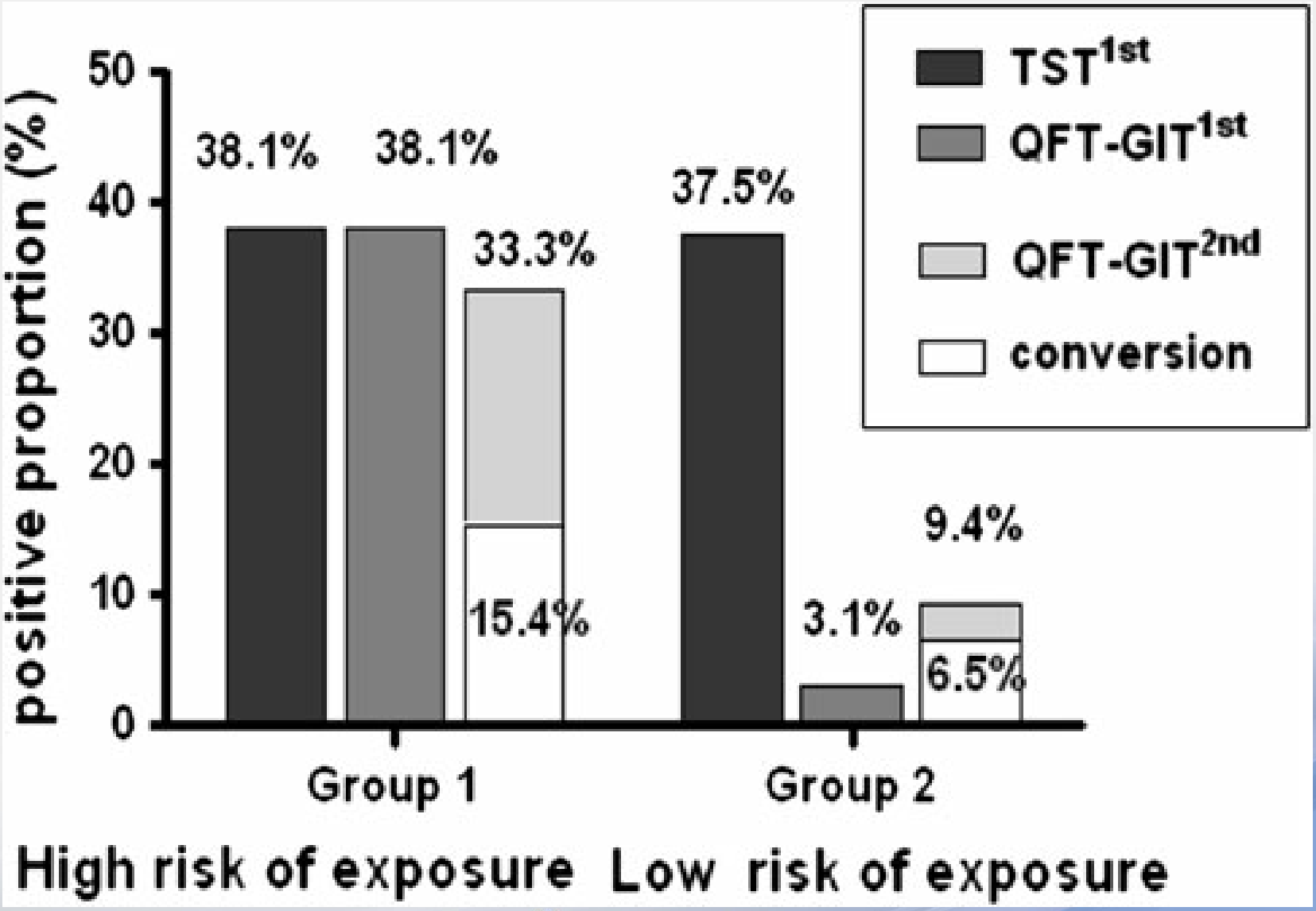
Lien et al. Plos one 2009; 4: e6798

German , 3,823 contact HCWs

Covariates		QFT -	QFT +	OR *	95% CI
Age	**N (Col-%)**	**N (Row-%)**	**N (Row-%)**		
<25 years	510 (13.3)	496 (97.3)	14 (2.7)	1	-
25–35 years	926 (24.2)	878 (94.8)	48 (5.2)	**1.72**	**1.71–1.72**
35–45 years	1039 (27.2)	965 (92.9)	74 (7.1)	**2.11**	**2.11–2.12**
45–55 years	975 (25.5)	868 (89.0)	107 (11.0)	**3.52**	**3.51–3.54**
>55 years	373 (9.8)	298 (79.9)	75 (20.1)	**6.89**	**6.87–6.91**
Gender					
Female	2959 (77.4)	2716 (91.8)	243 (8.2)	1	
Male	864 (22.6)	789 (91.3)	75 (8.7)	1.29	1.293–1.298
Country of birth					
Germany	3234 (84.6)	3012 (93.1)	222 (6.9)	1	
Foreign-born	589 (15.4)	493 (83.7)	96 (16.3)	**2.39**	**2.38–2.39**
TB in own history					
No	3788 (99.1)	3485 (92.0)	303 (8.0)	1	
Yes	35 (0.9)	20 (57.1)	15 (42.8)	**6.23**	**6.23–6.28**
TST in history					
no TST	1348 (35.5)	1254 (93.0)	94 (7.0)	1	
Negative	1635 (42.8)	1544 (94.4)	91 (5.6)	**0.74**	**0.737–0.74**
Positive	840 (22.0)	707 (84.2)	133 (15.8)	**1.99**	**1.99–2.0**
Workplace					
Other clinical wards	610 (16.0)	577 (94.6)	33 (5.4)	1	
Internal medicine	1286 (33.6)	1190 (92.5)	96 (7.5)	**1.40**	**1.40–1.41**
Admission ward	244 (6.4)	231 (94.7)	13 (5.3)	**0.90**	**0.89–0.91**
Infection ward	389 (10.2)	355 (91.3)	34 (8.7)	**1.76**	**1.75–1.76**
Geriatric care	449 (11.7)	404 (90.0)	45 (10.0)	**1.98**	**1.98–1.99**
Rad/Lab/Path	293 (7.7)	252 (86.0)	41(14.0)	**2.35**	**2.34–2.35**
Administration	117 (3.1)	101 (86.3)	16 (13.7)	**2.89**	**2.88–2.91**
ICU	435 (11.4)	395 (90.8)	40 (9.2)	**1.50**	**1.50–1.51**
Profession			Not included in the final model		
Physicians	583 (15.2)	538 (92.3)	45 (7.7)	0.82	0.82–0.824

Schablon A et al. PLoS One. 2014 Dec 26;9(12):e115322

South Korea, 53 HCWs, TST/IGRA f/u



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Kim SY et al. Infection. 2013 Apr;41(2):511-6.

South Korea, multicenter, 493 HCWs , TST/IGRA

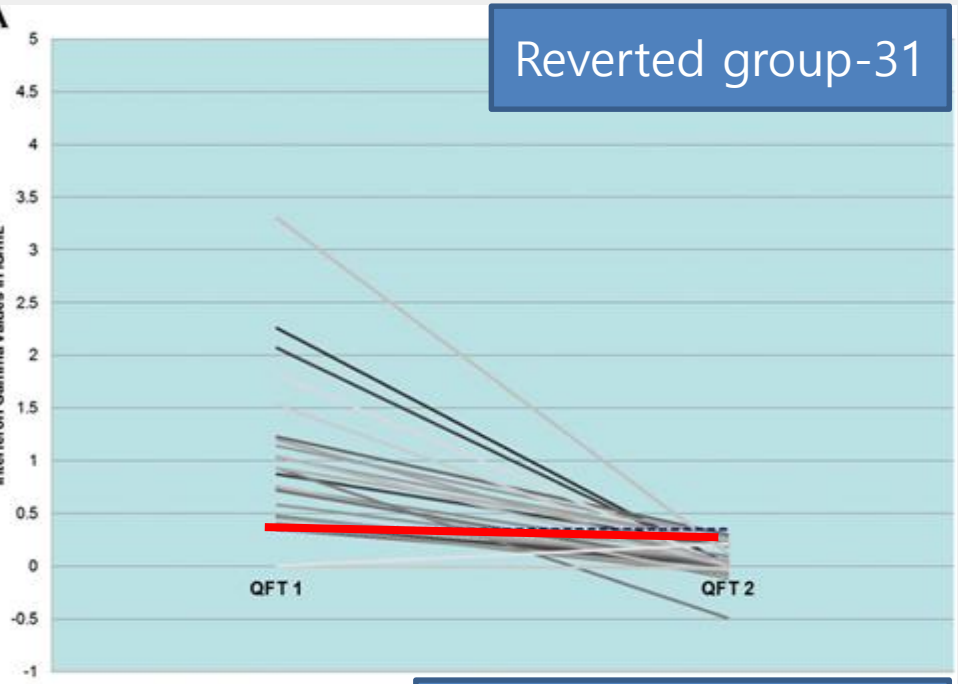
	QFT-GIT	
	Positive (%) (n=85)	Negative (%) (n=408)
TST		
Positive (n=181)	54 (11.0)	127 (25.8)
Negative (n=312)	31 (6.3)	281 (57.0)

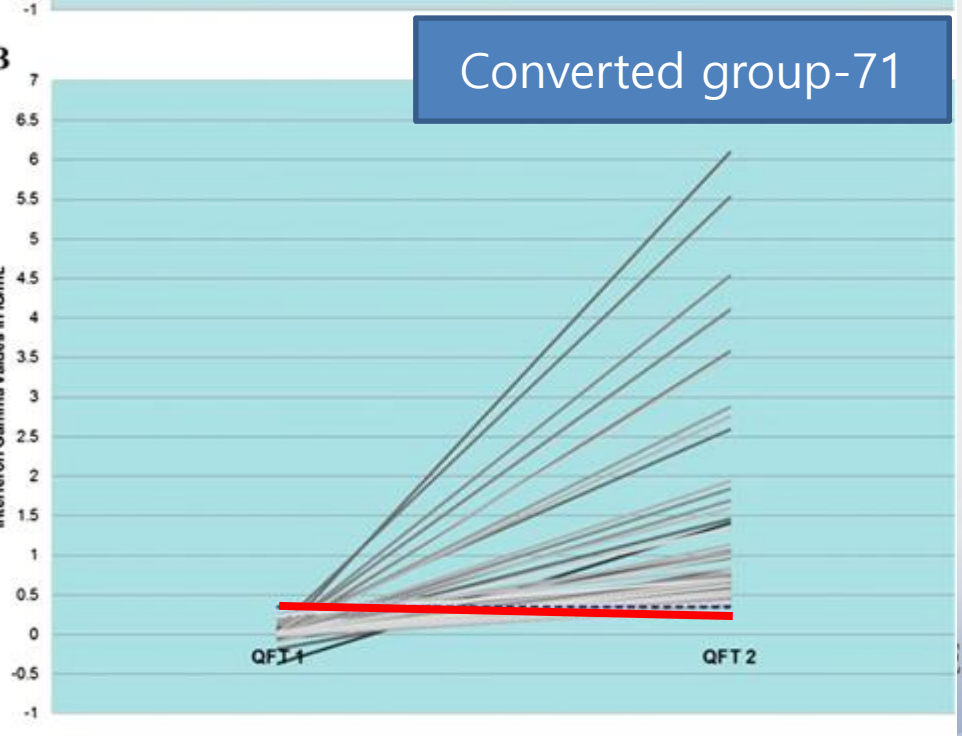
Hospitals	A	B	C	D	E	F	G	H
No. of hospital beds	2,680	736	640	836	902	900	500	498
No. of enrolled subjects	110	60	49	68	76	51	30	49
Medical personnel dedicated to TB infection control	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
TB infection control guidelines	Yes	No	Yes	No	Yes	Yes	Yes	No
Contact investigation	Yes	No	Yes	No	Yes	No	No	Yes
Positive TST results, n (%)	49 (44.5)	20 (33.3)	17 (34.7)	32 (47.1)	21 (27.6)	17 (33.3)	9 (30.0)	17 (34.7)
Positive QFT-GIT results, n (%)	12 (9.1)	9 (15.0)	14 (28.6)	11 (16.2)	6 (7.9)	17 (33.3)	7 (23.3)	9 (18.4)

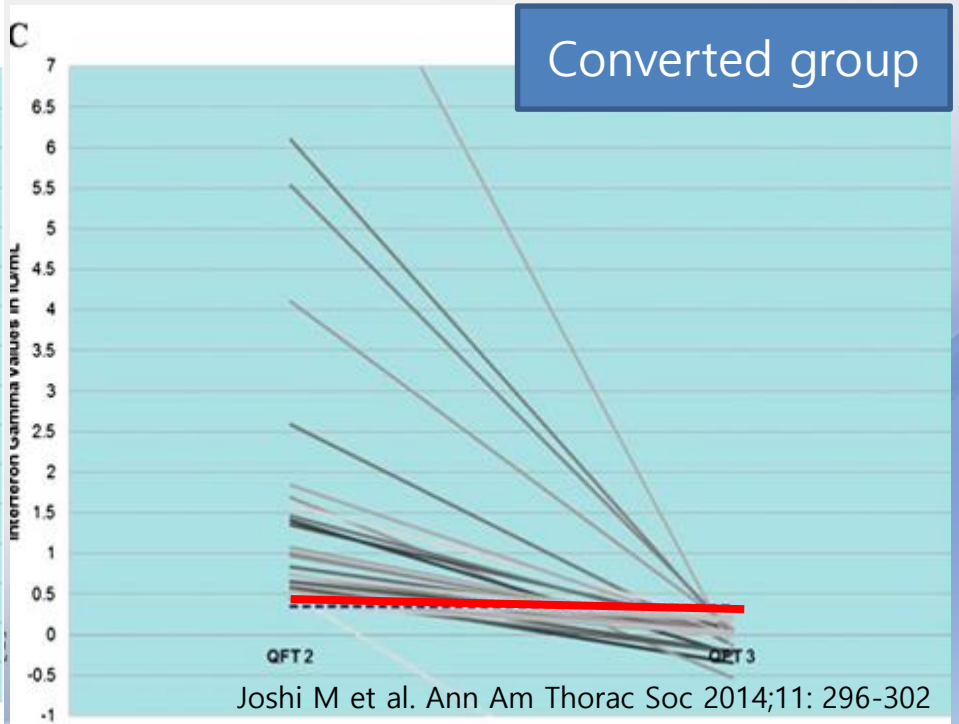
Jo KW et al. Tuberc Respir Dis 2013; 75(1):18-24

	No.	Positive TST		Positive QFT-GIT	
		No. (%)	p-value	No. (%)	p-value
Degree of contact with TB patients			0.656		0.135
None	63	19 (30.2)		5 (7.9)	
Mild	282	105 (37.2)		54 (19.1)	
Moderate	70	28 (40.0)		10 (14.3)	
Severe	78	30 (38.5)		16 (20.5)	
Current department			0.930		0.140
TB-related	180	66 (36.6)		37 (20.1)	
Not TB-related	313	116 (37.1)		48 (15.3)	
Years working in hospital			<0.001		0.005
<1	41	8 (19.5)		5 (12.2)	
1–5	245	75 (30.6)		32 (13.1)	
6–10	114	56 (49.1)		22 (19.3)	
11–15	68	29 (42.6)		16 (23.5)	
>15	25	14 (56.0)		10 (40.0)	
Experience of working in TB-related department			0.985		0.006
Yes	379	140 (36.9)		75 (19.8)	
No	114	42 (36.8)		10 (8.8)	

USA, 2,303 HCWs QFT f/u

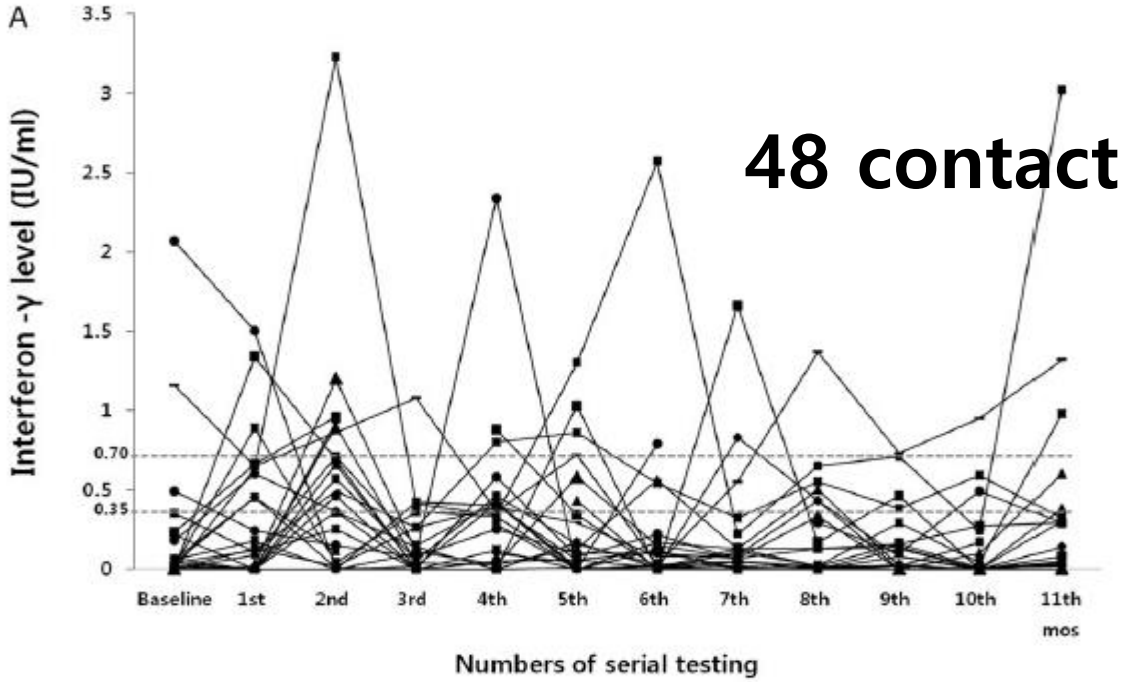


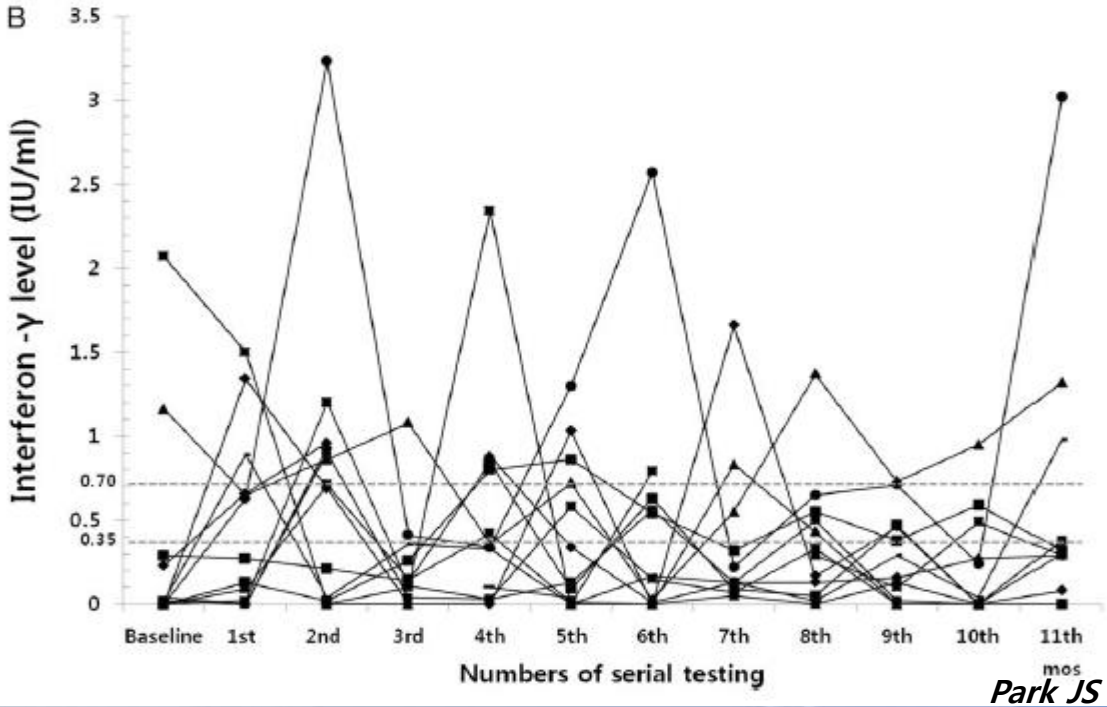




Joshi M et al. Ann Am Thorac Soc 2014;11: 296-302

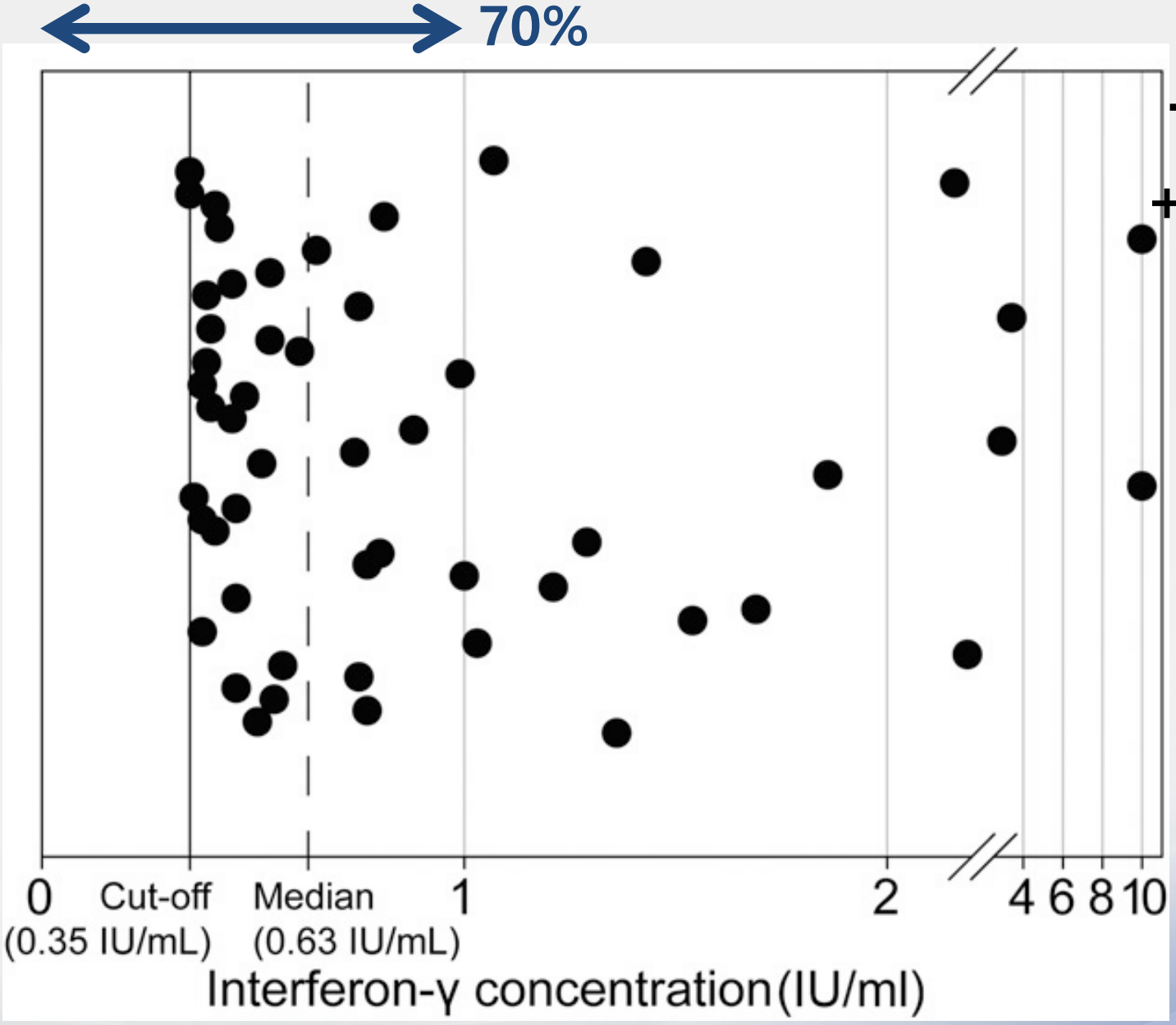
South Korea, 48 contact HCWs QFT f/u





25 (52%)
13 (27%)

Park JS et al. CHEST 2012; 142(6):1461–1468



USA,
7,374 HCWs
+ 486 (4.1%)

Kimberless S et al. ***CHEST 2012; 142(1):55–62***

USA, 216 HCWs , TST/IGRA f/u

Definition of Conversion	No. Serially Tested	No. of Conversions	% Incidence of Conversions (*95% CI*)
TST			
1. Baseline induration of < 10 mm and follow-up TST of ⩾ 10 mm, with increment of ⩾ 6 mm	147	14	9.5 (5.3–15.5)
2. Baseline induration of < 10 mm and follow-up TST of ⩾ 10 mm, with increment of ⩾ 10 mm	147	6	4.1 (1.5–8.7)
QFT			
3. Baseline IFN-γ < 0.35 IU/ml and follow-up IFN-γ ⩾ 0.35 IU/ml	147	17	11.6 (6.9–17.9)
4. Baseline IFN-γ < 0.35 IU/ml and follow-up IFN-γ ⩾ 0.70 IU/ml	147	11	7.5 (3.8–13.0)
Combinations of TST and QFT			
1 or 3	147	22	14.9 (9.6–21.8)
2 or 4	147	11	7.5 (3.8–13.0)
1 and 3	147	9	6.1 (2.8–11.3)
2 and 4	147	6	4.1 (1.5–8.7)

Pai et al. Am J Respir Crit Care Med Vol 2006;174: 349-355

Portugal, 2,884 HCWs f/u , QFT

TB	QFT results					
	Negative		Borderline		Positive	
	<0.2 IU/mL		0.2– <0.7 IU/mL		≥0.7 IU/mL	
	n	%	N	%	n	%
TB in history	16	28.1	15	26.3	26	45.6
Active TB at screening	0	-	2	25.0	6	75.0
Progression to active TB	0	-	1	25.0	3	75.0
No TB	1,764	62.7	323	11.5	728	25.9
All	1,780	61.7	341	11.8	763	26.5

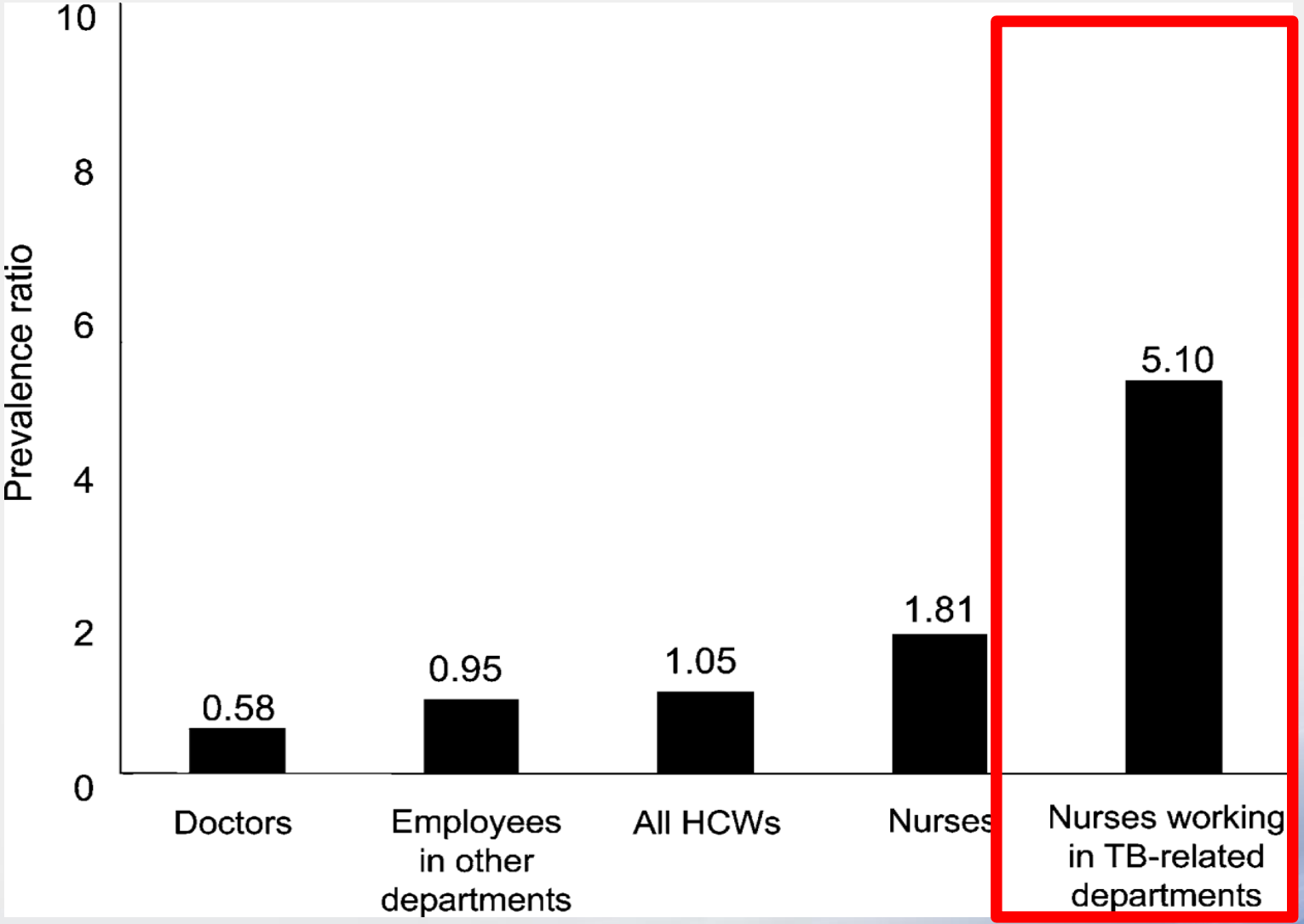
Niehnhaus et al. J Occup Med Tox 2013;8(1):1

USA, 19 centers , 42,155 HCWs , T. SPOT TB
Borderine – re test

Study	Setting	IGRA Used	Number of Subjects Tested	Conversion Rate (%)	Reversion Rate (%)
This study	19 U.S. hospitals	T-SPOT.*TB*	19,630	0.8	17.6
Dorman *et al.* (3)	4 large urban U.S. hospitals	T-SPOT.*TB*	2,418	8.3	63.9
Dorman *et al.* (3)	4 large urban U.S. hospitals	QFN	2,418	6.1	56.8
Fong *et al.* (9)	Cleveland Clinic, OH	QFN	1,857	2.8	80.0
Zwerling *et al.* (10)	McGill University Health Centre, Montreal, Canada	QFN	258	5.3	61.5
Joshi *et al.* (4)	Central Arkansas Veterans Healthcare System	QFN	2,303	3.2	45.0
Slater *et al.* (6)	Stanford University Medical Center, Palo Alto, CA	QFN	9,153	4.4	38.7

King et al. Am J Respir Crit Care Med 2015; 192: 367-373

- **Treatment to all HCWs with IGRA + ?**
- **Priority ?**



Jo KW et al. Int J Tuber Lung Dis 2008; 12:436-40

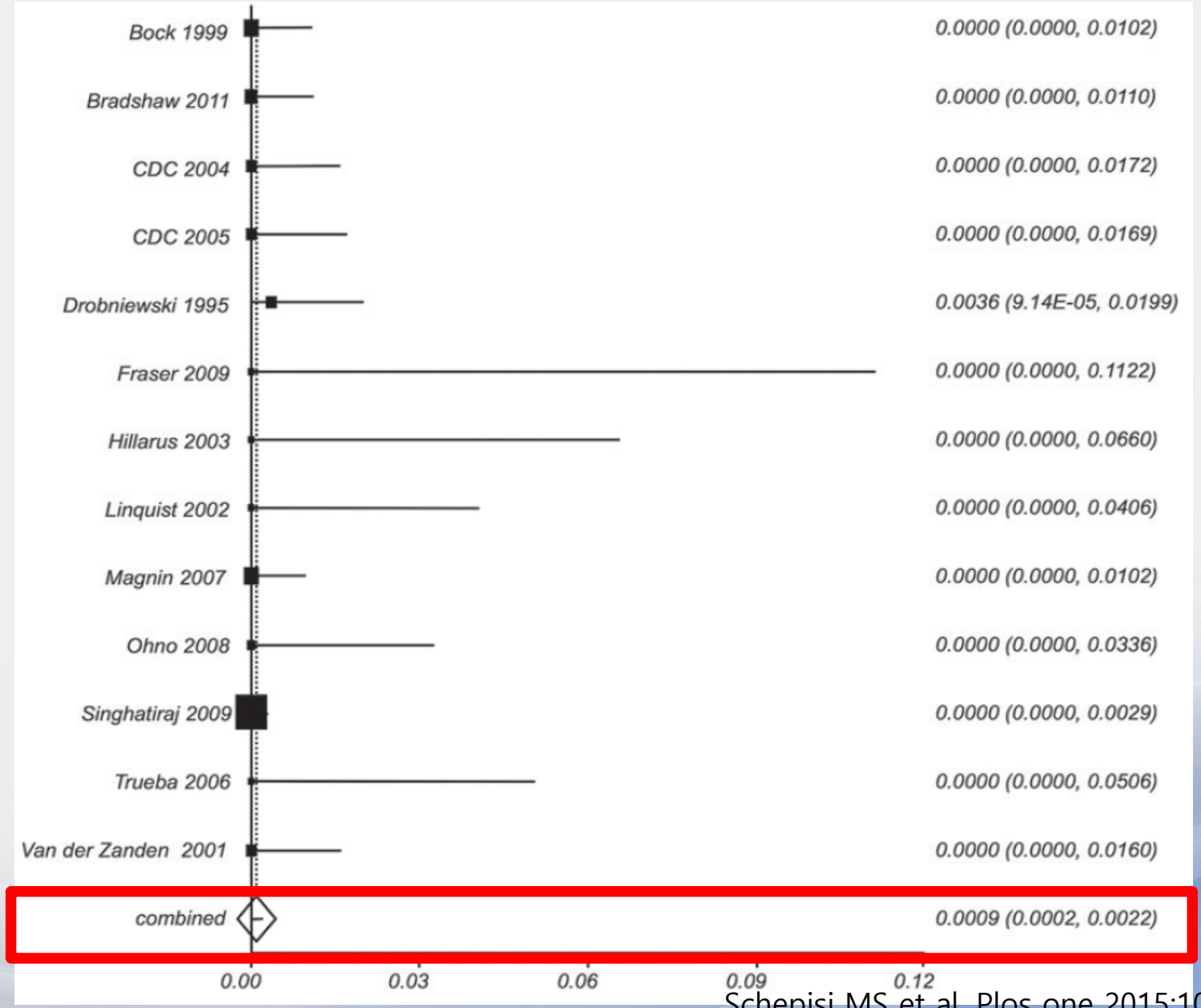
China

Item		No. of HCW	No. of TB	Prevalence (1/1000)
Gender and smoking*	Male, non-smoker	977	1	1.0
	Male, smoker	832	8	9.6
	Female	1937	11	5.7
Age group (years)	18-29	988	6	6.1
	30-39	1295	5	3.9
	40-49	1070	7	6.5
	≥ 50	393	2	5.1
BCG scar	No	2451	13	5.3
	Yes	1294	7	5.4
Job location	TB outpatient clinic	1187	9	7.6
	TB inpatient ward	197	3	15.2
	Supervision and monitoring	383	1	2.6
	Pharmacy	255	1	3.9
	X-ray	204	1	4.9
	Laboratory	305	2	6.6
	Administrative/logistic	1215	3	2.5
Duration of employment (years)	< 1	1383	5	3.6
	1-4	757	3	4.0
	5-9	613	6	9.8
	≥ 10	993	6	6.0
Level	Prefecture	869	5	5.8
	County/District	2877	15	5.2
TST induration (mm)[§, #]	0 - 9	1047	1	1.0
	10 - 19	687	6	8.7
	20 +	419	7	16.7

He et al. BMC Infectious Diseases 2010, 10:313

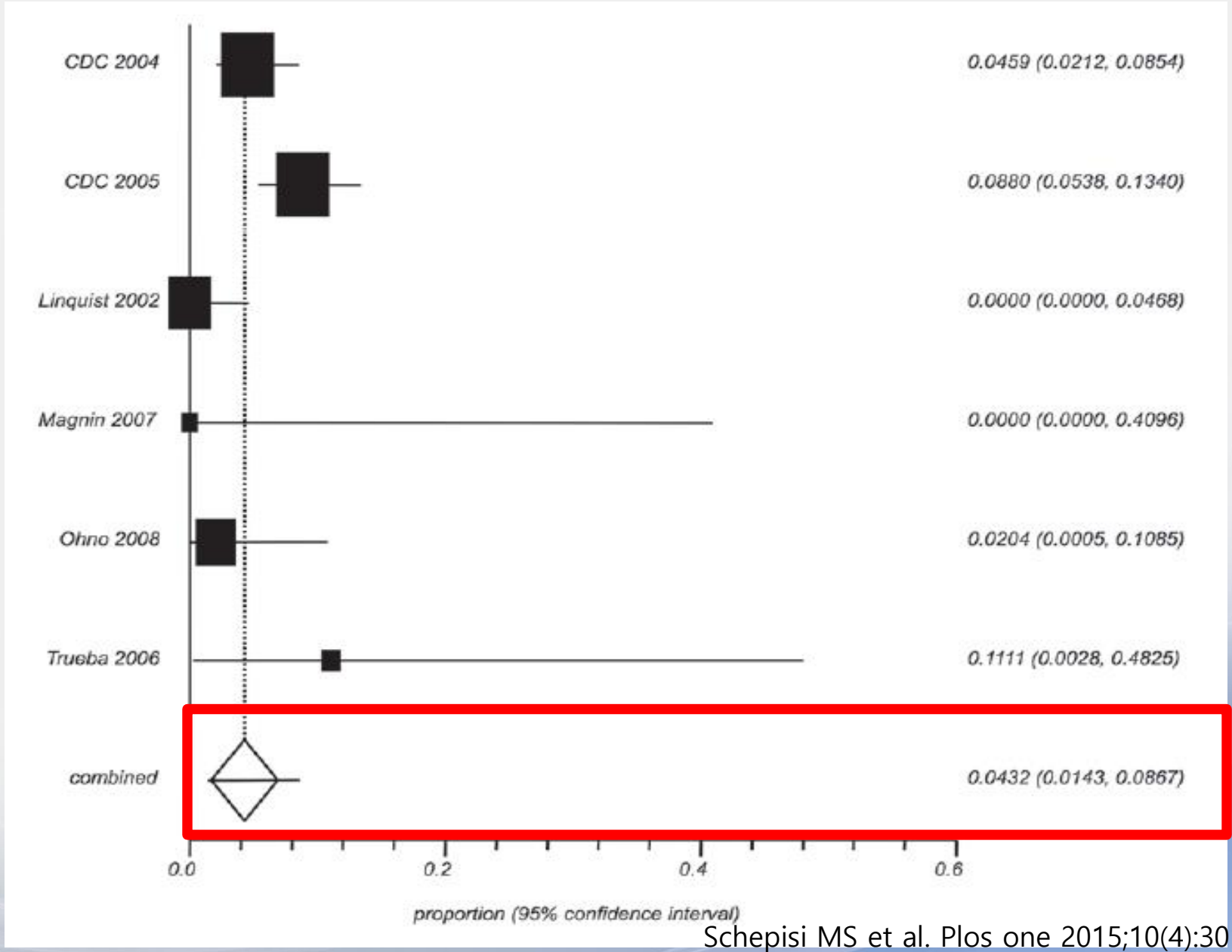
Variable		HCW N (%)	Induration ≥ 10 mm n (%)	Crude OR (95% CI)	Adjusted OR* (95% CI)
Gender and smoking	Male, non-smoker	526 (24.4)	253 (48.1)	1	
	Male, smoker	464 (21.6)	244 (52.6)	1.2 (0.9-1.5)	
	Female	1163 (54.0)	609 (52.4)	1.2 (0.9-1.5)	
Age group (years)	18-29	580 (26.9)	229 (39.5)	1	1
	30-39	740 (34.4)	399 (53.9)	1.8 (1.4-2.2)	1.6 (1.2-2.1)
	40-49	615 (28.6)	343 (55.8)	1.9 (1.5-2.4)	1.8 (1.3-2.5)
	≥ 50	218 (10.1)	135 (61.9)	2.5 (1.8-3.4)	2.6 (1.7-4.0)
BCG scar	No	1376 (63.9)	674 (49.0)	1	1
	Yes	777 (36.1)	472 (55.6)	1.3 (1.1-1.6)	1.4 (1.1-1.7)
Income (Yuan/Year)	< 15000	1106 (51.4)	528 (47.7)	1	
	15000-19999	691 (32.1)	361 (52.2)	1.2 (1.0-1.5)	
	20000-29999	298 (13.8)	182 (61.1)	1.7 (1.3-2.2)	
	> 30000	58 (2.7)	35 (60.3)	1.7 (1.0-2.9)	
Education	Primary or middle school	63 (2.9)	28 (44.4)	1	
	Secondary school	976 (45.3)	450 (46.1)	1.1 (0.6-1.8)	
	Junior college	898 (41.7)	496 (55.2)	1.5 (0.9-2.6)	
	University or above	216 (10.1)	132 (61.1)	2.0 (1.1-3.5)	
Position	Junior	1270 (59.0)	594 (46.8)	1	
	Middle	697 (32.4)	414 (59.4)	1.7 (1.4-2.0)	
	Senior	186 (8.6)	98 (52.7)	1.3 (0.9-1.7)	
Job location	Administrative/logistic	698 (32.4)	295 (42.3)	1	1
	TB outpatient clinic	609 (28.3)	333 (54.7)	1.7 (1.3-2.1)	1.9 (1.4-2.6)
	TB inpatient ward	165 (7.7)	101 (61.2)	2.2 (1.5-3.1)	1.3 (1.0-2.1)
	Supervision and monitoring	234 (10.9)	132 (56.4)	1.8 (1.3-2.4)	1.6 (1.2-2.3)
	Pharmacy	147 (6.8)	74 (50.3)	1.4 (1.0-2.0)	1.0 (0.7-1.6)
	X-ray department	122 (5.6)	78 (63.9)	2.4 (1.6-3.6)	1.8 (1.1-2.9)
	Laboratory	178 (8.3)	93 (52.2)	1.5 (1.1-2.1)	1.4 (0.9-2.0)

Active TB from HCWs



Schepisi MS et al. Plos one 2015;10(4):30121639

TB infection from HCWs



Schepisi MS et al. Plos one 2015;10(4):30121639

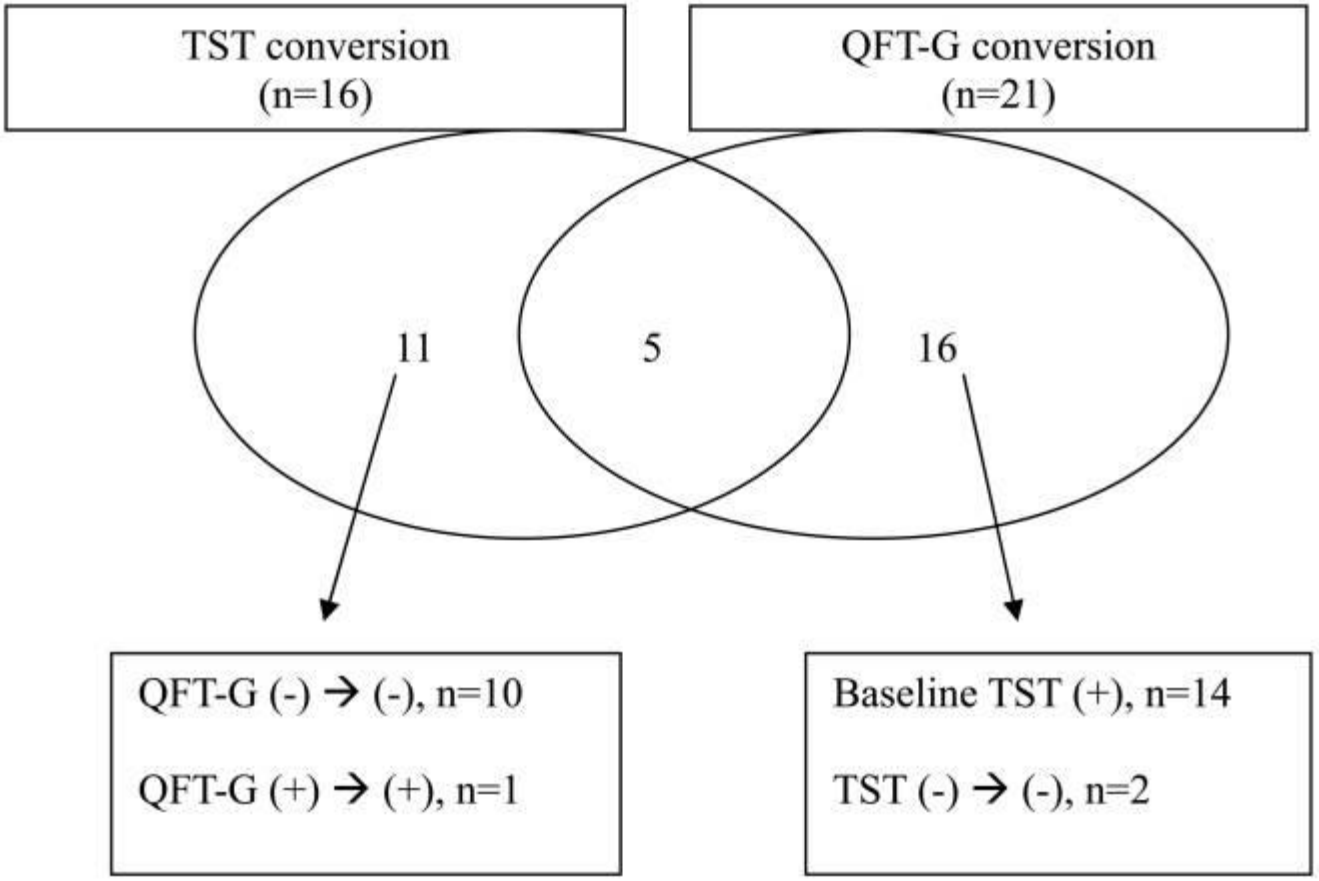
Reactivation risk of recent infection

Table 2. Lifetime Risk of Reactivation Tuberculosis.*

Size of Induration on Skin Test and Age	Nonconversion Positive Skin Test	Recent Conversion of Skin Test	Immunosuppressive Therapy	Old, Healed Tuberculosis	Advanced HIV Infection
	percent (95 percent confidence interval)				
Induration of ≥15 mm					
0–5 Yr	13 (10–16)	17 (12–24)	25 (7–87)	66 (34–100)	100 (88–100)
6–15 Yr	7 (6–8)	8 (6–10)	14 (4–46)	37 (21–67)	70 (52–92)
16–25 Yr	8 (5–15)	13 (8–21)	17 (3–84)	44 (15–100)	83 (39–100)
26–35 Yr	7 (4–13)	12 (8–19)	15 (3–74)	39 (14–100)	73 (35–100)
36–45 Yr	4 (2–7)	7 (5–12)	8 (2–39)	21 (8–57)	40 (20–79)
46–55 Yr	3 (2–6)	6 (4–10)	6 (1–32)	17 (6–46)	32 (16–44)
56–65 Yr	3 (2–4)	3 (1–7)	5 (1–23)	13 (5–33)	25 (14–46)
≥66 Yr	2 (1–3)	2 (1–5)	4 (1–17)	9 (4–24)	18 (10–33)
Induration of 10–14 mm					
0–5 Yr	10 (6–15)	13 (8–21)	20 (4–82)	53 (22–100)	100 (56–100)
6–15 Yr	4 (3–5)	5 (3–7)	8 (2–30)	20 (10–44)	38 (24–61)
16–25 Yr	7 (3–13)	10 (6–17)	13 (2–73)	35 (12–100)	66 (30–100)
26–35 Yr	6 (3–12)	9 (5–15)	12 (2–64)	31 (10–93)	58 (26–100)
36–45 Yr	3 (2–6)	5 (3–9)	7 (1–34)	17 (6–50)	33 (15–68)
46–55 Yr	3 (1–5)	5 (3–8)	5 (1–8)	14 (5–40)	26 (12–55)
56–65 Yr	2 (1–4)	3 (1–6)	4 (1–20)	11 (4–29)	20 (11–39)
≥66 Yr	2 (1–3)	2 (1–5)	3 (1–14)	8 (3–20)	15 (8–28)
Induration of 5–9 mm					
0–5 Yr	3 (2–6)	6 (2–12)	6 (1–31)	16 (6–45)	31 (15–63)
6–15 Yr	2 (1–3)	3 (2–5)	4 (1–17)	11 (5–25)	21 (13–34)
16–25 Yr	6 (2–14)	8 (4–17)	11 (2–79)	29 (7–100)	55 (19–100)
26–35 Yr	5 (2–13)	7 (3–15)	10 (1–69)	25 (6–100)	48 (17–100)
36–45 Yr	3 (1–6)	4 (2–9)	5 (1–34)	12 (3–50)	24 (8–68)
46–55 Yr	2 (1–5)	4 (2–8)	4 (1–28)	10 (3–40)	19 (7–55)
56–65 Yr	2 (1–3)	2 (1–6)	3 (0–18)	8 (2–26)	15 (6–36)
≥66 Yr	1 (0–2)	2 (0–5)	2 (0–13)	6 (2–19)	11 (4–26)

Horsburgh CR NEJM 2004;350(20):2060-7

LTBI annual incidence in Korea



SEVERANCE

Lee K et al. Infect Control Hosp Epidemiol 2009; 30:1218-1222

Summary

- LTBI control among HCWs is important.
- IGRA can be more specific test than TST among HCWs.
- However, the caution is needed in interpretation about serial test of IGRA.
- There is priorities in LTBI control among HCWs.

Thank you !

SEVERANCE