Supplementary Appendix.

Supplement to: Childhood BCG Vaccination and Risk of Pulmonary and Extrapulmonary Tuberculosis Throughout the Life Course: An Individual-participant Meta-analysis of 26 Case-Contact Cohort Studies

Additional Methodological Information.

Event Ascertainment

Events were ascertained using several strategies selected by each cohort's investigator group. For tuberculosis diagnosis events, cohorts either diagnosed cases prospectively or used data linkage to national or sub-national tuberculosis registries. Most prospective studies used some type of microbiological test, either as a baseline evaluation or a triage test. The full diagnostic algorithms and tests used for each study can be seen in the supplementary appendix. Diagnosis of tuberculosis in all prospective studies included either a positive microbiological test or a physical examination and subsequent clinical diagnosis. Some prospective studies used diagnostic tests as part of their study procedures and also used national or sub-national tuberculosis registries.

Systematic Search.

Case-control studies and outbreak reports were excluded, as were reviews, editorials, letters, or studies for which individual outcomes were not reported. We did not restrict articles by language and reviewed manuscripts written in English, Chinese, French, German, Japanese, Korean, Persian, Portuguese, Russian, and Turkish. To facilitate the review process, a list of 'exclusionary words' was developed, based on words in titles highly suggestive of irrelevant content (see below for complete explanation and list). Manuscripts were excluded if their titles contained any of these exclusionary words. Two reviewers (LM and OC) independently reviewed articles in two stages: evaluation of titles and abstracts followed by full-text review. After the review of titles and abstracts, the two reviewers discussed discrepancies and re-evaluated articles until consensus was reached. During this stage, if an abstract was in a language other than English the manuscript was advanced to the full-text review stage. Relevant articles were subject to a full-text review by both reviewers and any discrepancies were again resolved by reviewer discussion and consensus. If eligibility could not be assessed from the full-text manuscript because of missing information, we contacted authors for clarification. We evaluated eligible articles for duplication of data on the same individuals and excluded manuscripts if necessary. One study was found through an online database (Aibana, 2016).

Preventive Therapy.

Preventive therapy was assigned to participants according to each study's protocol or local guidelines and practices. We included any reported preventive therapy regimen in our analysis. A preventive therapy regimen was defined as initiation of any preventive drug regimen given and started to contacts. These regimens included isoniazid for six months, isoniazid for nine months, rifampin for three months, and rifapentine for three months, among others.

Study Quality.

Each study was judged based on a 9-point scale using three broad criteria: selection of participants (4 points), comparability of studies (2 points), and ascertainment of outcome of interest (3 points). High study quality was defined as >66.6%, moderate quality as 33.3-66.6%, and low quality as <33.3%. Discrepancies between the two reviewers were resolved by re-evaluating the study for consensus.

Study-level characteristics.

Country-level tuberculosis incidence data was collected from World Health Organization databases for each study. This variable was used as a continuous variable. Studies were categorized into "high-burden" country as classified by the World Health Organization. Studies were also grouped into

World Health Organization global regions and World Bank country-level economies (high- income, upper-middle-income, lower-middle-income, and low-income) as of October 2018.

Analytical code

All statistical analyses were conducted using Stata, version 14.0 (StataCorp LP, College Station, Texas) and R statistical software (R Foundation for Statistical Computing).

Search Strategy.

Pubmed/MEDLINE – 6252
Search conducted on April 7, 2018
(tuberculosis OR (mycobacterium tuberculosis[MeSH Terms]) OR tuberculosis[MeSH Terms])
AND
(contact tracing[MeSH Terms] OR infectious disease contact tracing[MeSH Terms] OR household*[Title/Abstract] OR contact*[Title/Abstract])

Embase – 8525
Search conducted on April 7, 2018
(tuberculosis OR 'mycobacterium tuberculosis')
AND
('contact examination'/de OR contact*)

Biosis – 3971
Search conducted on April 7, 2018
((TS=tuberculosis) OR (TS='mycobacterium tuberculosis') OR (TI=TB))
AND
((TS='contact examination') OR (TS=contact*) OR (TS='contact tracing') OR (TS=outbreak*))

Web of Science – 6537
Search conducted on April 7, 2018
((TS=tuberculosis) OR (TS='mycobacterium tuberculosis') OR (TI=TB))
AND
((TS='contact examination') OR (TS=contact*) OR (TS='contact tracing') OR (TS=outbreak*))

Total from Search: 25285.

Total from Search after Exclusion by Duplicates: 14927

Total from Search after Exclusion by Timeframe (pre-1998): 9753

Exclusionary Keyword Algorithm for Study Titles.

i. Description of the Algorithm.

We wrote a script parsing titles into individual words. We selected words highly suggestive that an article was unrelated to our study objectives. Articles were then eliminated based on whether their titles contained these words.

In order to validate this process, we implemented the algorithm on the first 100 titles and manually screened them for eligibility in the study. Our exclusionary algorithm eliminated all articles that were screened out by manual screening with 100% specificity. This suggested that our selected words were appropriate. Out of the 9,243 articles disqualified at the title stage, 1,829 (19.7%) were eliminated based on whether they contained one of the exclusionary words. The code for exclusion words and article elimination, as well as the entire list of exclusionary words can be found below.

ii. Python script:

```
'''
Script parsing tokens for excluding titles and matching the tokens to the original word counterpart to each token.

Each title is normalized to lower-case letters and numbers with no punctuation. Excluding tokens use this format.
A list of exclusion tokens is used to eliminate all matching titles.
'''
import pandas as pd
import string
from difflib import SequenceMatcher

import sys
reload(sys)
sys.setdefaultencoding('utf8')

def remove_punctuations(text):
    """Removes punctuation from the string text.

    :param text: string
    :return: string, with punctuation removed.
    """
    if isinstance(text, float): return text
    for punctuation in string.punctuation:
        text = text.replace(punctuation, '')
    return text

def similar(a, b):
    """
    Returns ratio of similarity between a and b in the range [0, 1].
    :param a: string
    :param b: string
    :return: float, between 0 and 1 inclusive
```

```
    """
    return SequenceMatcher(None, a, b).ratio()


def find_ex_word(ex_words_set, r):
    """
    Matches title words to exclusionary words.

    :param ex_words_set: set<string> of exclusionary words.
    :param r: pandas row
    :return: [(fraction, exclusion_word, title_word)] or 'No match' for no matches. The list contains all possible matches.
    """
    candidates = []
    if isinstance(r['Title_punctuations'], float):
        return 'No match'
    for word in r['Title_punctuations'].split(' '):
        if word in ex_words_set:
            for original in r['Title'].split(' '):
                candidate = (similar(word, original.lower()), word, original)
                candidates.append(candidate)
    candidates.sort(key=lambda x: x[0], reverse=True)
    candidates = [c for c in candidates if c[0] > 0.0]
    if not candidates:
        return 'No match'
    else:
        return candidates

def run():
    '''Main driver function '''
    all_articles_read = pd.read_csv('endnote_oliviasearch_0411.csv')  # read File containing titles
    all_articles_read = all_articles_read.dropna(subset=['Title'])  # remove blanks
    all_articles_read['Title_punctuations'] = all_articles_read['Title'].apply(remove_punctuations)
    all_articles_read['Title_punctuations'] = all_articles_read['Title_punctuations'].str.lower()  # make lowercase
    title_word_count = (all_articles_read['Title_punctuations'].str.split(expand=True).stack().value_counts(
        ascending=True))  # list of title with corresponding number of occurrences

    # Sheet of words and counts across titles.
    (pd.DataFrame(title_word_count).to_excel('title_word_count.xlsx', index=True))  # export title_word_count

    # Read in file of exclusion words. Filter out titles that contain them.
    exclusion_words = pd.read_excel('exclusion_words.xlsx')  # read File containing words to exclude

    exclusion_word_delim = [r'\b' + item + r'\b' for item in exclusion_words.word]
```

```
    exclusion_words_str = '|'.join(exclusion_word_delim)
    filtered = all_articles_read[all_articles_read['Title_punctuations'].str.contains(
        exclusion_words_str) == False]  # remove article titles if they contain exclusion words
    (pd.DataFrame(filtered).to_excel('907_exclude_test.xlsx', index=True))  # export remaining titles

    ex_words_set = set()

    for word in exclusion_words['word']:
        ex_words_set.add(word)

    # List of tuples of match ratio (0-1), token, original_word
    matches = all_articles_read.apply(lambda x: find_ex_word(ex_words_set, x), axis=1)

    # build a dictionary from token to the best possible match
    ex_dict = dict()
    for match in matches:
        if match != 'No match':
            for n in match:
                key = n[1]
                if key not in ex_dict:
                    ex_dict[key] = n
                else:
                    ex_dict[key] = max(n, ex_dict[key])

    # mapping from token to original word
    matched_dict = dict()
    for value in ex_dict.values():
        if value[0] > 0:
            matched_dict[value[1]] = value[2]

    # see if any of the exclusion words were never matched to an original title word
    words_not_found = []
    for w in ex_words_set:
        if w not in matched_dict:
            words_not_found.append(w)

    original_words = [x[2] for x in ex_dict.values()] + words_not_found # write all words out
    serialized = ', '.join(original_words)
    f = open('/Users/ocords/Desktop/original_words_test.txt', 'w')  # creates text files words as
appear in original titles
    f.write(serialized)
    f.close()


if __name__ == '__main__':
    run()
```

iii. List of words:

anti-coronavirus, A(2)CoMnO(6), Sulfhydrylase, influenza, polypeptides, lysosome, Thermococcus, YMn6-xTixSn6, amphotericin, reductoisomerase, porcine, Enteric, cryptococcosis, milk, cytokines, langurs, perianal, Birthplace, benzoquinone:, dichloroacetate, penile, polyunsaturated, Protein-RNA, peanut, squirrels:, Halogen, dairy, 3-(pyrazin-2-ylcarbonyl)dithiocarbazic, choliangiopancreatography, leukocytes, rhesus, ppe38, dermatophytosis, heme, Biofilms, extremophiles, UDP-galactopyranose, D-3-phosphoglycerate, peafowl, Salmonella, monkeys, ESAT-6-dependent, O-Acetylserine, mongooses, Primate, spoligofamily, (+1188A/C), Nicotinamide, vitrectomy, Isoniazid/Rifampicin/Poly, Shiga, Trypanosoma, A/H3N2, brucellosis, veterinarians, wild-boar, phosphorylated, Amoeba-Resistant, Cyclodestructive, pJHCMW1, miliary, subspecies, prostatitis, enterocolitica, hydrolysis, hematology-oncology, prisons, histone-like, macrophages, vampire, Pseudoaneurysm, lovebird, celiac, Guanine-Cytosine-Rich, phosphatase, Hsp70, factor-microRNA, osteoporosis, bovis, Bird, S12-S7, actinobacterial, CRF08_BC]., Corynebacteriurn, raccoons, brucei, ribose, kangaroo, herd, PD-1/PD-L2, beta-cyclocitral, alphaA-crystallin,, water-soluble, Ag85B, PCR-restriction, helicase, CXCL10/IP-10, inter-species, beta-semialdehyde, Asp299Gly, host-parasitoid, corynebacterium, Paracoccidioides, cinnamon,, Orang-Utan, metal-induced, raccoon, military, lymphadenitis, calf-to-calf, Lanthanide(III)-Phthalocyanine, sacroiliitis, Pseudomonas, extremophile:, mct1Delta, MD-2, Anions, glutaraldehyde, earth-nickel-indides, Coxsackievirus, transplant, arthropod, obliterans, catalase-peroxidase, Dy5Ni2In4, petroleum, Frog, oryx, low-molecular-mass, Automata, microbiota, electroelution, phytopathogen, (P631H), IL-17RA, psoriasis, Shiga-toxin-producing, staphylococcus, Microaggregates, 49-year-old, SAT6-CFP10, E-coli, chimpanzee, Metalloprotease-1, Adenosine, biotin, rabbit, radiculomyelitis, penis, Rv0753c, flora, animals, GC1237, K182G, PstS-1(285-374):CFP10, Death-Ligand, cat, mammalian, Arg753Gln, oxide, ligase, MDP-1, C1858T, proteasomal, Helicobacter, aminoglycoside, neurosarcoidosis, nursing, gingiva., Rv1737c, ferrets, pelvic, camelids, keratitis, CYP121-fluconazole, alpacas, gingivalis, cows, Oligosaccharides, confocal, hydrogen, species, Lamb, ribokinase, Lumbricidae), jails, paleopathological, pharyngitis-a, Cryoannealing-induced, rhinoceros, Micelle-based, animal, elephant, oropharyngeal, goat, ligand-independent, fever, aureus, Bacteriophages:, canker, fungus, possum, pigs, M2e.HSP70c, MVA85A,, prostate:, Leishmania, Bloodstream, calves, immune-endocrine, macrolide,, crystallin, disposable-sheath, jail, methadone, ID83/GLA-SE, Channel-Forming, crystallographic, Association-of-Primate-Veterinarians,, CD127-cells, antelope, phagocytosis, cryptosporidiosis, albicans, RE4Ni11In20, ulcerans, epilepsy, brucellosis--a, avium, PD-Ligand, Game-Theoretic, nitrogen, gonadal, Carnivores, 1-deoxy-D-xylulose-5-phosphate, badger, FMO2, leprae, antigen/N-trimethylaminoethylmethacrylate, ligand, botanical, protein-3, transferase, Cryptosporidium, m(1)A58, flavins, Rv1735c,, conspecific, Foxp3, coffee., cholera, food, diphosphate, osteolytic, Tb-2(SO4)(3), hypoxic, chemokines, phagocytes, exon, (Giraffa, metabolite, nematodes, DT104, ClpP1P2,, meat, aeruginosa, thymus., hemagglutinin, neoformans, esat-6, phytopathogenic, coronavirus, 33-year-old, amphiphilic, pyrimidine, CFP21-MPT64, bed-nets, sulfoglycolipids, D543N, chlamydial, Animal-Derived, myelin, elephants, Enterobacteriaceae, fish, sugars, bovine, 11p14-15, oncological, Quantum, lysis, protein-II, C(-159)T, semen, heme-degrading, metagenome, MPT51, phosphoryl, CD8+T, wildlife-pathogen, anorexia, (sIL-7R), cyber-gaming, c.1770-1900, arthritis, zoological, alkynes., lipopolysaccharide-induced, O3157, oligonucleotide, pre-ulcer, mammal, substrate-binding, host-microbial, agarose, monkey, phage-based, equine, SLC11A1, H1N1, braziliensis, Pseudo-septic, ostrich, Opiate-Driven, G354R, swine, Cyanide, osteomyelitis, phagosomes, ionic, raptors, borreliosis, sympatric, helix-turn-helix, buffaloes, leishmaniosis, 6-kilodalton, small-bowel, malonyl-CoA:AcpM, exostosis:, TLR4, antirheumatic, mammary, Earthworms, b-cell, sheep, ESAT-6/CFP-10, RMn6X6-x, pyrophosphatase., leptospirosis, sapiens,

chimaera, Variable-Number-Tandem-Repeats, fragment-length, dyskinesia, leprae-specific, 4-Sulfamoylphenyl-omega-aminoalkyl, amines, pylori-Associated, Variant-Repeat, Carotenoids, human-livestock-wildlife, cytokine--IL-12,, resuscitation-promoting, Endoluminal, rickshaw, inmates, herds, Caulobacter, pheasants, non-contact-lens, vulvar, hemangiopericytoma:, mannose-binding, H-2K(k), IS6110, microglial, vulval, IL1B, flavin-binding, apiospermum, tubules, A0248:, mink, macaw, Legionella, fowl, kDa/MPT-64,, phosphoantigen-mediated, foodborne, phosphoribosyltransferase, lymphoblastic, rat, menstruus), dendritic, CD4+CD25, IS6110-fAFLP, glycopeptidolipid, MyD88, 30/31-kDa, smallpox, aeruginosan, amphibious, Crystallography, Tattoo-Related, clonality, DNA-probes, Xanthium, zoo, endangered, heat-shock, bullfrogs, serine, HLA-A*0201-Restricted, Chromosomes, botulinum, EGGS., protein-10, cytokines/chemokines, free-ranging, host-parasite, Hsp16.5, carcinoma, Brucella, vitro-selected, Elk-Fetus, ranavirus, Rv0081,, hemothoraces, Adenine, minisatellites, hydrocephalus, phospholipase, mannose, kDa/CFP-10,, socioepidemiologic, H-2-rich, fungal, bioarchaeology, cholerae, coli, human-wildlife, macaque, Rv1498A., pseudodiphtheriticum, aviary, ulcer, 30-kDa, hemangioendothelioma-case, (RE)(12)Co5Bi, G2109A), bronchoscopy-a, camelopardalis), kinase, GlfT2,, otorhinolaryngology, ESAT-6/MPT-64, Wood, Demodecidosis, salmonellosis, N-acetyl-gamma-glutamyl-phosphate, glycolipid, slit-lamp, Methylisothiazolinone, Nanocluster, palaeopathological, (10.1016/S1473-3099(17)30447-4)), histone, asbestos, Orang, endocarditis:, Cytokine-based, cyclopropane, cervids, cj0183, chrysomya, primates, CD8, Campylobacter, sarcoidoisis, CD14-159C/T, spondyloarthritides, KIR3DL1/S1:, faeciuml,d-transpeptidase, abortus, dUTPases, tumors, heterocyclic, O157:H7/H-strains, chitotriosidase, lymphokine, IL-12Rbeta2, PENGUINS, bison, cyanobacterial, Hydrogen-bonding, aegypti, Synechococcus, pseudokinase, uveitis, 10.1093/cid/ciw694), Thymidylyltransferase, alanine, supramolecular, L-isoleucine, anthropozoonotic, chondrosarcoma, 2,3-Naphthalocyaninato, ionization-time-of-flight, CD1d-dependent, cattle, Salmonellae, thrombocytopenic, thrombocytopenia, IL12RB1, Neurobrucellosis:, House-Roosting, CHIMPANZEES, nucleoside, pets, zebrafish, ebola, CD1-mediated, chaperonin, (S1473309917304474), CD8-positive, gonorrhoeae, lymphocyte, (T874A, Clavibacter, Chihuahua, zoonoses, bushbuck, cervical, exomes, STAT3, Cow, hantavirus, cruzi, gyrase-fluoroquinolone, peptidoglycan, androgens, filariasis., CCR4, single-amino-acid, Ms6564,, lipases, Arg677Trp,, Tattoo-associated, Dysphagia, cancer, CRISPRs, Synthases,, Cryptogenic, peptide-binding, Clostfdium, thermophilus, crystalline, grazing, amino, myeloid-derived, Rv3802c, beef, Enterococci, (-362g/c), intracellular, benzaldehydes:, tracheobronchopathia, macaques, chromatography-tandem, interleukins, hydrolase, SrCl2-Promoted, pseudogene, Rv1057, isomerase, CD41, Lipid-Polymer, chain-binomial, CD40, Hydrogels, 1,2,4-triazoles,, ophthalmic, actinomycetemcomitans, Otolaryngological, miR-26a,, species-history, Apoptosis-associated, (S0140673615001518), tortoise,, cytotoxic, MazF-mt6, haematobium, Toxoplasma, Herpesvirus, CYP2E1, MS0006, leprosy, wild, cell-entry, interleukin-4, galactofuranosyltransferase, interleukin-1, cell-wall, CD1-presented, methyltransferases, glycaemic, Strongyloidiasis:, PstS1(285-374):CPF10:, ducks, polymerase, Proteolytic, eczema, sarcoma, beta-Lactamases:, Upregulated, 5-Phosphate, Nonsyphilitic, (CD11b/CD18), hyodysenteriae, ribosome, larva, Ccr2, helicases, Dengue/Zika, palsies, rrs491, cytolysis, Chromolaena, proleukin, IS3-based, chickenpox, Neutron, alcohol-resistant, zoonosis, 3-Deoxy-D-manno-octulosonate, difficile-associated, gastroenterology, nicotinohydrazide, typhoid, Anesthesiology, streptococcus, epizooties, ML2331, transposon, hydroxylase, poultry, 3-dioxygenase, C-24-methyltransferase, cytosolic, Th1/Th2, (IL)-12p70, chickens, vertebra:, chemokine, giraffe, post-implantkeratoprosthesis, 8-Phosphate, brasiliensis, streptomycin, lambs, mechanism-based, biochip, livestock, Glycine, ORS571, Lentivirus-control, Carboxylic, scabies, super-oxidized, mutase, sarcoidosis, Chagas, Mongoose, dpp3, macroscopic, Pyrazinamidase, cervix, boars, catalytic, RD1-epitopes, ML1419c, swine-origin,

papulonecrotic, lattice, matricellular, prison, lymphocytes, nitrocellulose-bound, murine, IL-17-producing, parenchymal, apnea., scrofuloderma, nanofilters, prosthesis-free, Ospedalieri., wavelength, '-[(E)-2,6-Dichlorobenzylidene]pyrazine-2-carbohydrazide, C8G, Dy(III)-Phthalocyanine, furanoside, lymphoma, bioterrorism-related, Glucose-1-Phosphate, Sulfonyl-hydrazones, glycolipid-I, qualitative, spelunking:, brachiocephalic, Kuala, nosocomial, Estriol, Amoebae, antiprotozoal, leucoryx,, partridges, CeFeSi-type, ulcers, EMRSA-15, 38-kDa, CD56+CD3+, CYP121:, (H5N1), Protein-Ligand, CXCL10, Transcriptome, Gonococcal, pestis, gastrostomy, ungulate, pet, veterinary, fox, anti-leishmanial, goats, e59414,, syphilis, H7N9, wild-caught, zoonotic, IS6110-RFLP, metal/metal, core, Rv2721c), Tetrakis(4-chlorophenyl)borate, abattoirs, squirrel, CFP10, CCL18, dental, p38, autophagosomes, nanoliter, leukocyte-leukocyte, tetramer, wildlife, Autophosphorylation, Rv2628, tumor, Lynx, tannic, alpha-Substituted-2-Phenylcyclopropane, ribose-5-phosphate, Posttraumatic, badgers, pH-dependent, CYP51., aortic, protease, F15/LAM4/KZN, haplotype, D2EHPA, (pyrazinecarbonyl)hydrazones, mitochondrial, sow., ex-vivo, non-ruminant, dehydrogenase, MCP-2, neutrophil-mediated, larvae., reticulum-related, crystallization, herbivores, Larval, Oligomycin, polymerization, cats, nitric, PPE39, 5q31.1, ML0405, CD1-lipid, CD4+CD45RO+T-Cells, tyrosine, metaproteomics., helminths, Convex-probe, chikungunya, mammals, keratinocyte, chromosomal, vivax, PCC7942., phenylalanine, Zika, PTPN22, CYP125:, Enterovirus, malate, Peppermint, apes, Octahydrocyclopenta[c]pyrrol-2-yl, aneurysm, 38kDa-antigen, polymorphisms, 'Zebra', rabbits, Cpn60.2, kinetics, Cytokine-Induced, deer, Enterococcus, Rv1733c,, pig, demethylase, lichen, Hypercalcemia, ticks, NOS2A, CFP10ESAT6, Rv0183, 14alpha-sterol, Lgn1, tandem-repeat, keratoplasty, Coxiella, N-(4-Bromophenyl)pyrazine-2-carboxamide, peptides, UVB-irradiated, snakes, photoluminescence, nanopore, thromboendarterectomy, actinorhodin, Glycosaminoglycans, IS1106, arthritis-associated, carboxylase, Vibrio, diesters, N-(2-Chloroethyl)pyrazine-2-carboxamide, peptide-25, inguinal, macrophage, non-methylated, cellulose-targeting, PCR-single-strand, camelus)., Flavohemoglobin, RegX3, Neuropilin-1, gonorrhea, Bartonella, citrate, electroretinographic, tnf_il2, bovus, antitnf_, v_11, guinea pig, 5_untranslated

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References for All Individual Studies in BCG Vaccination and Mortality Analysis.

4 Cohorts; 18,015 participants

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Martinez (2018) Cohort
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Seddon (2014) Cohort
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Supplementary Table. PICO framework

PICO framework	Classification
Patient population or problem	Persons with close exposure to tuberculosis
Intervention	BCG vaccinated at birth
Control or comparative intervention	Placebo' (i.e., unvaccinated)
Outcome	All tuberculosis, pulmonary tuberculosis, extrapulmonary tuberculosis, death

Supplementary Table. Heterogeneity (measured through the I^2) in all models from manuscript

	All Tuberculosis	Pulmonary Tuberculosis	Extrapulmonary Tuberculosis
	I^2	I^2	I^2
All Participants			
Overall	0	37.6	36.0
Age Group			
<5	0	0	0
5–9	0	0	0
10–14	0	0	0
15–24	0	0	0
25–34	15.6	0	0
≥35	30.3	59.7	11.5
Positive TST or IGRA			
Overall	19.5	55	0
Age Group			
<5	54.7	67.5	11.8
5–9	17	0	0
10–14	0	0	0
15–24	0	0	0
25–34	53.2	49.1	0
≥35	31.8	59.7	77.3
Negative TST and/or IGRA			
Overall	1.7	0	9.2
Age Group			
<5	11.6	0	0
5–9	0	0	0
10–14	0	0	0
15–24	0	0	0
25–34	0	0	0
≥35	68.7	82.6	0

Supplementary Table. Comparison of results from main manuscript and when excluding persons living with HIV.

	Primary Manuscript		Without persons living with HIV	
	$N_{participants}$	Adjusted Odds Ratio (95% CI)	$N_{participants}$	Adjusted Odds Ratio (95% CI)
All Tuberculosis				
All Participants				
Overall	68,552	0.82 (0.74–0.91)	19,497	0.81 (0.68, 0.95)
Age Group				
<5	10,537	0.66 (0.51-0.87)	3,426	0.64 (0.46-0.88)
5–9	11,225	0.76 (0.51-1.14)	2,577	0.53 (0.33-0.85)
10–14	9,037	0.99 (0.66-1.48)	2,250	0.93 (0.56-1.55)
15–24	10,612	1.32 (0.99-1.75)	3,831	1.03 (0.70-1.51)
25–34	8,165	1.17 (0.83-1.64)	2,424	0.99 (0.52-1.90)
≥35	18,976	0.84 (0.67-1.06)	4,989	0.88 (0.60-1.29)
Positive TST or IGRA				
Overall	16,660	0.81 (0.69-0.96)	9,434	0.82 (0.67-1.00)
Age Group				
<5	2,541	0.68 (0.47-0.97)	1,233	0.70 (0.46-1.07)
5–9	2,855	0.62 (0.38-0.99)	1,056	0.56 (0.32-0.95)
10–14	2,542	0.87 (0.52-1.46)	1,036	0.97 (0.52-1.81)
15–24	2,786	1.21 (0.83-1.76)	1,852	1.19 (0.75-1.88)
25–34	1,968	1.18 (0.69-1.99)	1,347	0.84 (0.43-1.68)
≥35	3,968	0.77 (0.52-1.15)	2,910	0.75 (0.46-1.21)
Negative TST and/or IGRA				
Overall	23,848	0.84 (0.62-1.14)	9,438	0.52 (0.36-0.76)
Age Group				
<5	6,442	0.54 (0.32-0.90)	2,053	0.42 (0.23-0.76)
5–9	6,431	1.29 (0.51-3.24)	1,417	0.50 (0.17-1.49)
10–14	4,194	1.56 (0.61-3.96)	1,111	0.96 (0.30-3.08)

15–24	2,639	1.01 (0.49-2.08)	1,851	0.40 (0.18-0.90)
25–34	1,472	0.97 (0.38-2.47)	970	1.54 (0.19-12.29)
≥35	2,670	0.98 (0.43-2.25)	1,840	0.87 (0.27-2.56)

Supplementary Table. Risk of Death Among BCG Vaccinated and Unvaccinated Participants, Overall and by Age Group.

	$N_{Cohorts}$	$N_{Participants}$	N_{Events}	Relative Risk (95% CI)	Adjusted Relative Risk (95% CI)
Overall	4	18,175	50	0.26 (0.14, 0.51)	0.32 (0.16, 0.61)
Age Group					
<5	4	4,567	14	0.13 (0.04, 0.42)	0.20 (0.06, 0.71)
5-9	4	6,139	7	0.10 (0.02, 0.54)	0.14 (0.02, 0.80)
10-14	4	4,632	13	0.12 (0.04, 0.37)	0.14 (0.04, 0.45)
≥15	4	2,837	16	0.87 (0.27, 2.80)	1.13 (0.35, 3.71)

Supplementary Table. Risk of Death Among BCG Vaccinated and Unvaccinated Participants with a Positive QuantiFERON or Tuberculin Skin Test, Overall and by Age Group.

	$N_{Cohorts}$	$N_{Participants}$	N_{Events}	Relative Risk (95% CI)	Adjusted Relative Risk (95% CI)
Overall	3	4,378	9	0.14 (0.04, 0.55)	0.22 (0.05, 1.07)
Age Group					
<5	3	1,162	2	0.05 (0.00, 0.85)	0.05 (0.00, 0.78)
5-9	3	1,348	1	NA	NA
10-14	2	961	1	NA	NA
≥15	1	907	5	0.65 (0.11, 3.92)	0.73 (0.12, 4.54)

Supplementary Table. BCG vaccination and Mortality Risk, Stratified by Age and Sex.

	Cohorts	Participants	Events	Relative Risk (95% CI)	Adjusted Relative Risk (95% CI)
All participants					
All	4	18,175	50	0.29 (0.15, 0.56)	0.32 (0.16, 0.61)
Age Group					
<5	4	4,567	14	0.13 (0.04, 0.42)	0.20 (0.06, 0.71)
5-9	4	6,139	7	0.10 (0.02, 0.54)	0.14 (0.02, 0.80)
10-14	4	4,632	13	0.12 (0.04, 0.37)	0.14 (0.04, 0.45)
≥15	2	2,837	16	1.14 (0.35, 3.73)	1.13 (0.35, 3.71)
Males					
All	4	9,066	27	0.19 (0.08, 0.44)	0.23 (0.10, 0.56)
Age Group					
<5	4	2,347	8	0.08 (0.02, 0.36)	0.10 (0.02, 0.48)
5-9	4	3,110	4	0.03 (0.00, 0.24)	0.03 (0.00, 0.30)
10-14	4	7,776	19	0.08 (0.02, 0.38)	0.09 (0.02, 0.46)
≥15	2	1,285	8	3.15 (0.34, 29.36)	NA
Females					
All	4	9,114		0.40 (0.14, 1.09)	0.45 (0.17, 1.20)
Age Group					
<5	4	2,220	6	0.37 (0.04, 3.66)	0.55 (0.06, 4.93)
5-9	4	3,029	3	NA	NA
10-14	4	2,313	6	0.20 (0.04, 1.13)	0.21 (0.04, 1.19)
≥15	2	1,552	8	0.56 (0.13, 2.47)	0.56 (0.13, 2.47)

Table. Interferon-gamma release assay results and BCG effectiveness

	Cohorts	Participants	Events	Adjusted Relative Risk (95% CI)
Outcome, All Tuberculosis				
All Participants tested with IGRAs				
Overall	7	4,648	175	1.36 (0.91-2.05)
Age Group				
<5	7	746	60	0.39 (0.13-1.22)
5–9	7	862	22	0.52 (0.16-1.67)
10–14	7	766	16	0.75 (0.27-2.08)
15–24	6	977	38	4.14 (1.40-12.26)
25–34	4	547	20	1.70 (0.64-4.52)
≥35	4	750	19	1.03 (0.35-3.02)
Positive IGRA				
Overall	7	2,503	132	1.19 (0.74-1.91)
Age Group				
<5	7	316	43	0.33 (0.05-2.23)
5–9	7	448	17	0.39 (0.10-1.62)
10–14	7	444	15	0.65 (0.23-1.86)
15–24	6	497	28	2.73 (0.87-8.58)
25–34	4	329	16	1.95 (0.64-6.00)
≥35	4	469	13	0.66 (0.19-2.23)
Negative IGRA				
Overall	7	2,145	43	2.12 (0.95-4.77)
Age Group				
<5	5	383	17	0.29 (0.06-1.39)
5–9	7	414	5	0.90 (0.08-10.40)
10–14	7	322	1	…
15–24	…	480	10	…
25–34	2	157	4	1.28 (0.17-9.75)
≥35	4	281	6	2.12 (0.40-11.21)

Supplementary Table. Number of events and participants among vaccinated and unvaccinated groups

	Vaccinated Group		Unvaccinated Group	
	Events	**Participants**	**Events**	**Participants**
Outcome, Pulmonary Tuberculosis				
All Participants				
Overall	916	41,118	334	16,161
Age Group				
<5	120	6,484	34	749
5–9	71	7,834	11	796
10–14	100	6,212	25	813
15–24	258	6,930	53	2,287
25–34	142	4,805	37	2,689
≥35	225	8,853	174	8,827
Positive TST or IGRA				
Overall	610	10,506	128	2,088
Age Group				
<5	93	1,452	25	159
5–9	49	1,827	10	219
10–14	68	1,641	17	232
15–24	161	1,589	31	516
25–34	96	1,245	15	347
≥35	143	2,752	30	615
Negative TST and/or IGRA				
Overall	132	15,677	35	2,601
Age Group				
<5	25	3,879	8	473
5–9	22	4,527	1	451
10–14	17	2,853	6	398
15–24	32	1,738	7	558
25–34	14	1,009	4	235
≥35	22	1,671	9	486
Outcome, Extrapulmonary Tuberculosis				
All Participants				
Overall	106	40,314	38	15,869
Age Group				
<5	15	6,380	8	724
5–9	13	7,781	5	790
10–14	18	6,130	2	790
15–24	28	6,699	7	2,242
25–34	14	4,678	10	2,663
≥35	18	8,646	6	8,660
Positive TST or IGRA				

Overall	54	9,950	16	1,976
Age Group				
<5	10	1,369	5	139
5–9	6	1,784	4	213
10–14	9	1,582	2	217
15–24	15	1,443	4	489
25–34	3	1,152	0	332
≥35	11	2,620	1	586
Negative TST and/or IGRA				
Overall	26	15,571	9	2,575
Age Group				
<5	4	3,857	3	468
5–9	6	4,510	1	451
10–14	8	2,844	0	392
15–24	5	1,713	2	553
25–34	3	996	1	232
≥35	0	1,651	2	479

Supplementary Table. Definition used for classification of BCG vaccination status in each individual study.

First Author	Definition of BCG vaccination
Acuña-Villaorduña	BCG scar
Aibana	BCG scar
Bonnet	BCG vaccination was documented if a BCG scar was observed or on reviewing the vaccination card
Carvalho	BCG scar; further information not detailed
Chan	BCG immunization records were obtained from the National Immunization Information System
Del Corral	BCG vaccination was documented if a BCG scar was observed or on reviewing the vaccination card
Egere	BCG scar
Espinal	BCG scar
Fox	Not described
Hannoun	BCG scar
Hill	BCG scar
Huerga	BCG scar
Jones-López	BCG scar
Lemos	BCG scar
Lienhardt	BCG scar
López-Varela	BCG scar
Lu	BCG scar
Mandalakas	BCG vaccination scar and written history information collected
Martinez	BCG vaccination was assessed through inspecting BCG scars and confirmed with medical records.
Mazahir	BCG vaccination was assessed by presence of scar and immunization card
Seddon	BCG scar
Sharma	BCG scar
Singh	BCG scar
Triasih	Not described
Verhagen	BCG scar

Yuhara	BCG scar

Supplementary Table. Assessment of Quality of the Included Studies.

We assessed the quality of each study based on a modified version of Newcastle-Ottawa scale (Wells, 2012)†. We assessed each study's selection process, comparability, and outcome for a maximum total of 9 points. Studies were ranked high if they had a score of greater than 66.6%, moderate if they had a score greater than 33.3 and less than or equal to 66.6%, and low if they had a score of less than or equal to 33.3%. 32/45 (71.1%) of studies were high quality, 11/45 (24.4%) of studies were moderate quality, and 2/45 (4.4%) of studies were low quality.

Study†	**Selection**			**Comparability**	**Outcome**			**Rating**		**Quality**
	Representativeness of sample[a]	**Ascertainment of exposure - How was index case diagnosed?[b]**	**Demonstration that TB was not present at baseline.[c]**	**Comparability of cohorts (2 points)[d]**	**Assessment of pediatric tuberculosis (2 points)[e]**	**Was follow up long enough for outcomes to occur?[f]**	**Adequacy of follow up of exposed[g]**	**Rating**	**PERCENT SCORE (X/9)**	
Aibana, 2016	A*	A*	A*	A*/B*	A*/B*	A*	E	8	0.89	high
Grandjean, 2010	A*	A*	C	B*/C	A*/C	A*	E	5	0.56	moderate
Grandjean, 2015	C	A*	A*	A*/B*	A*/B*	A*	E	7	0.78	high
Otero, 2016	A*	A*	C	B*/C	B*	A*	D	5	0.56	moderate

Hill, 2008	A*	A*	A*	A*/B*	A*/B*	A*	C*	9	1.00	high
Acuna-Villaorduna, 2017	B*	A*	A*	B*/C	A*/B*	*A	E	7	0.78	high
Lee, 2017	A*	C	C	B*/C	D	A*	E	3	0.33	moderate
Chan, 2014	A*	A*	A*	B*/C	A*/B*	A*	E	7	0.78	high
Ling, 2011	A*	A*	A*	B*/C	A*/B*	A*	E	7	0.78	high
Triasih, 2015	C	A*	A*	A*/D	A*/B*	A*	B*	7	0.78	high
Seddon, 2013	B*	A*	B*	A*/D	A*/B*	A*	B*	8	0.89	high
Chakhaia, 2014	C	A*	A*	C/D	A*/B*	A*	E	5	0.56	moderate
Yoshiyama 2015	C	A*	B*	B*/C	A*/C	A*	D	5	0.56	moderate
Singh, 2013	A*	A*	A*	A*/B*	A*	A*	D	7	0.78	high
Altet, 2015	A*	A*	A*	A*/B*	A*/B*	A*	B*	9	1.00	high
Yuhara, 2013	A*	A*	B*	B*/C	A*/B*	A*	E	7	0.78	high

Zellweger, 2015	A*	B	A*	A*/D	D	A*	B*	5	0.56	moderate
Wang, 2012	B*	A*	B*	A*/B*	A*/B*	A*	E	8	0.89	high
Mazahir, 2017	A*	A*	A*	A*/D	A*/B*	A*	A*	8	0.89	high
Moyo, 2015	A*	A*	C	B*/C	A*	A*	C*	6	0.67	moderate
Lu, 2015	B*	A*	B*	B*	D	A*	C*	6	0.67	moderate
Martinez, 2018	A*	A*	A*	A*/C	A*/B*	A*	A*	8	0.89	high
del Corral, 2009	A*	A*	A*	A*/B*	A*/B*	A*	B*	9	1.00	high
Sloot, 2014	C	A*	A*	B*/C	A*/B*	A*	C*	7	0.78	high
Verhagen, 2014	A*	A*	A*	A*/B*	A*/B*	A*	D	8	0.89	high
Sharma, 2017	B*	A*	B*	A*/B*	A*/B*	A*	E	8	0.89	high
Lemos, 2004	B*	A*	A*	A*/D	A*/B*	A*	B*	8	0.89	high
Fox, 2018	A*	A*	A*	A*/B*	A*/B*	A*	B*	9	1.00	high

Lienhardt, 2010	A*	A*	A*	A*/B*	A*/B*	A*	D	8	0.89	high
Dobler, 2013	A*	C	A*	C/D	D	A*	E	3	0.33	low
Van Schalwayk, 2014	B*	B	A*	A*/D	A*/C	A*	D	5	0.56	moderate
Lopez-Varela, 2017	A*	A*	A*	A*/D	A*/B*	A*	B*	8	0.89	high
Talat, 2010	A*	A*	A*	A*/B*	A*/B*	A*	B*	9	1.00	high
Anger, 2012	B*	A*	A*	C/B*	B*	A*	C*	7	0.78	high
Gounder, 2015	A*	A*	A*	C/B*	B*	A*	C*	7	0.78	high
Egere, 2017	A*	A*	A*	A*/D	A*/B*	A*	E	7	0.78	high
Espinal, 2000	B*	A*	B*	A*/D	A*/B*	A*	D	7	0.78	high
Macintyre, 1998	A*	C	A*	C/D	B*	A*	E	4	0.44	moderate
Haldar, 2013	B*	A*	A*	A*/D	A*/B*	A*	E	7	0.78	high

Geis, 2012	B*	A*	C	A*/D	B*	A*	B*	6	0.67	moderate
Bonnet, 2017	B*	A*	A*	A*/B*	A*/B*	A*	D	8	0.89	high
Huerga, 2018	A*	A*	A*	A*/B*	A*/B*	A*	C	8	0.89	high
Carvalho, 2001	B*	A*	A*	A*/D	B*	A*	E	6	0.67	moderate
Patel, 2017	A*	A*	C	A*/B*	A*/B*	A*	E	7	.77	high
Kato Maeda, 2019	A*	A*	C	A*/B*	A*/B*	A*	D	7	.77	high

†Hannoun, 2016 was a conference abstract and therefore was not included in the assessment.

[a] A*- Representative of the average TB case/TB contact in the community; B*- Somewhat representative of the average TB case/TB contact in the community; C - Selected group of TB cases/TB contacts, chance of bias; D - No description of the derivation of the cohort;

[b] A*- Microbiological (smear, culture, Xpert) testing of TB cases was done for all tuberculosis index cases; B - Chest radiographical/clinical diagnosis of tuberculosis index cases without microbiological testing; C - No description of the derivation of the cohort;

[c] A*- Reported testing for and numbers of tuberculosis cases at baseline; B*- Reported prevalent tuberculosis as an exclusion criteria for incident tuberculosis; C - No demonstration of lack of tuberculosis disease at baseline visit

[d] A*- Prospective Cohort; B* - Adjusted odds ratio; C - Retrospective Cohort; D - Adjusted Odd Ratio not specified; E - nothing specified;

[e] A*- Microbiological testing; B* - Radiographical and clinical (must have both); C - Radiographical or clinical (only 1); D - No description;

[f] A* - Yes (at least 3 months) after exposure to infectious patient with mycobacterium tuberculosis*; B - No; C - Information not provided;

g A* - If prospective, contacts exposed were evaluated for tuberculosis during follow-up; B* - If prospective, <= 10% of contacts exposed lost to follow up; C* - If retrospective, number lost to follow-up or excluded is reported and <=10%; D - If retrospective or prospective, greater than 10% lost to follow up; E - If prospective or retrospective, number lost to follow up not reported.

Supplementary Table. Tuberculosis Case Definition for Each Study

First Author, Publication Year	Definition
Aibana, 2015	Defined TB disease according to the consensus guidelines[1] for classifying TB disease
Grandjean, 2015	Definition not clearly specified: TB disease is defined as any patient with evidence of TB disease from sputum smear, culture, chest X-ray or clinical diagnosis that led to initiation of TB treatment
Acuna-Villaorduna, 2017	Diagnosed via the Information System for Disease Notification database.
Lee, 2017	Diagnosed via the National Health Insurance Research Database
Wang, 2012	Active TB disease was diagnosed if: 1) the mycobacterial cultures for sputum samples yielded *Mycobacterium tuberculosis*; and/or 2) chest radiography performed revealed new patch(es) of consolidation, collapse, lymphadenopathy, mass or nodule, cavitary lesion or infiltrate without other proven etiology, which was improved after standard anti-tuberculous treatment; and/or 3) information on the national TB reporting website showing that the contact had been reported and confirmed as a new case of TB.
Martinez, 2018	Diagnosis based on positive *Mycobacterium TB* culture from at least 1 site, or at least 2 of the following in the context of a positive response to TB therapy: 1) symptoms of TB including fever, cough for >2 weeks, and weight loss; 2) a positive TST; 3) chest radiography consistent with active TB; or 4) failure to respond to empiric antibiotics in 2 weeks.
Lienhardt, 2010	Diagnosed cases were classified as possible, probable, or definite. 1. Definite: 1 positive acid-fast bacilli result - smear or gastric aspirate, excluding single scanty acid-fast bacilli result; Or 1 positive culture from any body tissue, fluids, or secretion 2. Probable: any child with possible TB who had, in addition to the above: Chest X-ray with features of pulmonary TB, single scant acid-fast bacilli result. 3. Possible: chest X-ray, TST >15 mm or TST 10 mm if BCG scar absent, or proven recent TST conversion and suggestive clinical signs and symptoms.
Carvalho, 2001	Not specified

Abbreviations: TB, tuberculosis. TST, tuberculin skin test. CXR, chest X-ray. BCG, Bacillus Calmette–Guérin. QFT-GIT, QuantiFERON®-TB Gold In-tube. WHO, World Health Organization.

Supplementary Table. Diagnostic Criteria or Algorithms Used in Baseline Evaluations for Included Studies.

We summarize the baseline diagnostic algorithm used by each study by reading a representative manuscript. (See 'References for All Individual Studies'.) Not all diagnostic approaches were readily accessible from these published manuscripts. Baseline diagnostic evaluations were divided into those that were given to all participants, those that were given to a subset of participants, and those for which it was not specified whether they were given to the entirety or a subset of the cohort.

First Author, Publication Year	Baseline Evaluations, All Participants	Baseline Evaluations, Subset of Participants	Baseline Evaluations, Participants Not Specified
Aibana, 2016	TST, symptom screen	clinical assessment, culture, smear	
Grandjean, 2015			clinical assessment, CXR, culture, smear
Acuna-Villaorduna, 2017	case notification, TST, IGRA	culture, smear	
Lee, 2017	case notification		
Wang, 2012	CXR, culture, smear, T-SPOT	response to treatment	
Martinez, 2018	symptom screen, TST, clinical assessment	cerebrospinal fluid, CXR, gastric aspirates, lymph node aspirates, pleural fluid, culture, smear	
Lienhardt, 2010	clinical assessment, IGRA, symptom screen, TST	CXR, gastric aspirate, culture, smear	
Carvalho, 2001	CXR, symptom screen, TST		

Supplementary Table. Diagnostic Criteria or Algorithms Used in Follow-up Evaluations for Included Studies.

In the below table, we summarize the baseline diagnostic algorithm used by each study. (See 'References for All Individual Studies'.) Not all diagnostic approaches were readily accessible from these published manuscripts. Baseline diagnostic evaluations were divided into those that were given to all participants, those that were given to a subset of participants, and those for which it was not specified whether they were given to the entirety or a subset of the cohort.

First Author, Publication Year	Follow-up Evaluations, All Participants	Follow-up Evaluations, Subset of Participants	Follow-up Evaluations, Participants Not Specified
Aibana, 2015	TST, symptom screen	clinical assessment, culture, smear	
Grandjean, 2015			clinical assessment, CXR, culture, smear
Acuna-Villaorduna, 2017	case notification		culture, smear
Lee, 2017	case notification		
Wang, 2012			CXR, response to treatment, symptom screen, culture, smear
Martinez, 2018		clinical assessment, cerebrospinal fluid, CXR, gastric aspirates, lymph node aspirates, pleural fluid, culture, smear	
Lienhardt, Senegal	symptom screen	clinical assessment, CXR, gastric lavage, culture, smear	
Carvalho, 2001			smear, response to treatment, tests for hilar adenopathy

Supplementary Table. Requested variables from externally contacted authors with individual-patient data.

Contact Requested Variables	Index Case Requested Variables	Environmental Characteristics
Age	Age	Number of Persons in Household
Sex	Sex	Number of Siblings
HIV Status	HIV status	Charcoal use in household
Body Mass Index	Smoking Status (yes/no, # per day, etc.)	Household Ventilation
Relationship to the Index Case	Education Level	Type of housing
Administered Preventive Therapy	Duration of cough (or diagnostic delay)	
BCG Vaccination status	Sputum Smear Status	
Education Level	Cavitary disease status	
Past Active Tuberculosis	Culture status	
Household or community exposure	Multidrug-resistant status (if available)	
Closeness to Index Case	Alcohol use (yes/no, # per day, etc)	
Fever (any of >14 days)	Sputum smear grade	
Cough (any or of a certain length)	History of incarceration	
Hemoptysis	Diabetes status	
Weight loss or failure to thrive		
Night sweats		
Poor appetite		
Coprevalent (baseline) tuberculosis		
Incident tuberculosis		
Time from baseline of TB diagnosis		
Alcohol use (yes/no, # per day, etc)		
Diabetes status		
Smoking Status (yes/no, # per day, etc)		

Supplementary Table. BCG vaccination policy in each study country as given by the BCG World Atlas. †

Country	Current BCG vaccination	BCG recommendation type	Multiple BCG?	Multiple BCG in the past?	Timing of 1st BCG?	Year of changes to BCG schedule	Details of Changes
Algeria	Yes	Current national BCG vaccination policy for all	…	…	At birth or within 4 wks	…	…
Amsterdam	No	BCG recommendation only for specific groups or none at all	…	…		1979, 2005, 2016	1979: Discontinuation of vaccination healthcare; 1979: Selective vaccination of children born in Netherlands with one or both parents born in high-incidence countries; 2005: Selective vaccination limited to children born in the Netherlands with one or both parents born in a country with a WHO estimated TB incidence >50/100 000; 2016: Change from BCG SSI (Denmark) to BCG Bulbio (Intervax, Bulgaria)
Armenia	Yes	Current national BCG vaccination policy for all	Yes	No	At birth	2002	Approval of National BCG Calendar
Australia	No	Past national BCG vaccination policy for all	No	No	After infancy: School age	1980s	Moved to selective vaccination of at risk groups

Brazil	Yes	Current national BCG vaccination policy for all	No	Yes	At birth (up to 1 year of age) - Between birth and 1 month of age	1927, 1968, 1994, 2006	1927: Began oral vaccines; 1968: Replaced oral vaccine with intra-dermal vaccines; 1994: Began revaccinations at 6 years of age; 2006: Stopped revaccinations
Canada	No	BCG recommendation only for specific groups or none at all	No	No	After birth, within 1 yr	2011 data: 1960s-1970s	2011 data: Discontinuation of routine BCG vaccination in many provinces/territories
China	Yes	Current national BCG vaccination policy for all	No	Yes	At birth	…	…
Colombia	Yes	Current national BCG vaccination policy for all	No	No	At birth	None	…
Dominican Republic	Yes	Current national BCG vaccination policy for all	…	…	At birth	…	…
Germany	No	Past national BCG vaccination policy for all	No	No	At birth	1951 & 1975	Histories different for West and East Germany (East: 1951, revacc of TST neg at age 15years, also used different strains, more info in questionnaire...1975-move to vaccinate high risk kids only

India	No	Current national BCG vaccination policy for all	No	No	At birth	1948, 1949, 1951, 1978 & 1985	1948: BCG intro as pilot project, 1949: Immunization program in schools, 51-59 Mass immunization campaigns. 1978: extended program of immunization to be given at birth or within 1st mo, 1985: universal immunization program BCG vaccine policy continued as earlier
Indonesia	Yes	Current national BCG vaccination policy for all	No	No	At birth (up to 1 year of age) - 0-2 months	None	…
Mozambique	Yes	Current national BCG vaccination policy for all	…	…	At birth	…	…
Peru	Yes	Current national BCG vaccination policy for all	No	No	At birth	…	…
Senegal	Yes	Current national BCG vaccination policy for all	No	No	At birth	None	…
South Africa	Yes	Current national BCG vaccination policy for all	No	Yes	At birth	2000	2000: stop Tokyo 1572 percutaneous, start Danish intradermal
Spain	No	Past national BCG vaccination policy for all	No	No	At birth	1981	Systematic BCG vaccination ceased

Taiwan	Yes	Current national BCG vaccination policy for all		No	Yes	At birth (up to 1 year of age) - Between 5-8 months	1953, 1958, 1965, 1979, 1997, 2016	1953: Strain shifted to Pasteur Institute; 1958: Strain shifted to new Pasteur strain; 1965: Vaccination of newborns and infants (previous vaccination target was school children with negative TST); 1979: BCG production using Tokyo 172 strain; 1997: Stopped revaccinations; 2016: Delay vaccination time to 5-8 months after birth or less than 1 year old
The Gambia	Yes	Current national BCG vaccination policy for all		No	No	At birth	None	…
Uganda	Yes	Current national BCG vaccination policy for all		No	No	At birth (up to 1 year of age)	None	…
United States	No	BCG recommendation only for specific groups or none at all		No	No	…	None	…
Venezuela	Yes	Current national BCG vaccination policy for all	…		…	At birth	…	…
Vietnam	Yes	Current national BCG vaccination policy for all		No	No	At birth	None	…

† All information can be found on the BCG World Atlas website, http://www.bcgatlas.org/ or the following manuscript: Zwerling, A., Behr, M.A., Verma, A., Brewer, T.F., Menzies, D. and Pai, M., 2011. The BCG World Atlas: a database of global BCG vaccination policies and practices. *PLoS Medicine*, 8(3).

Supplementary Table. PRISMA-IPD Checklist of items to include when reporting a systematic review and meta-analysis of individual participant data (IPD)

A1 – A3 denote new items that are additional to standard PRISMA items. A4 has been created as a result of re-arranging content of the standard PRISMA statement to suit the way that systematic review IPD meta-analyses are reported.

PRISMA-IPD Section/topic	Item No	Checklist item	Reported on page
Title			
Title	1	Identify the report as a systematic review and meta-analysis of individual participant data.	1
Abstract			
Structured summary	2	Provide a structured summary including as applicable:	2
		Background: state research question and main objectives, with information on participants, interventions, comparators and outcomes.	
		Methods: report eligibility criteria; data sources including dates of last bibliographic search or elicitation, noting that IPD were sought; methods of assessing risk of bias.	
		Results: provide number and type of studies and participants identified and number (%) obtained; summary effect estimates for main outcomes (benefits and harms) with confidence intervals and measures of statistical heterogeneity. Describe the direction and size of summary effects in terms meaningful to those who would put findings into practice.	
		Discussion: state main strengths and limitations of the evidence, general interpretation of the results and any important implications.	
		Other: report primary funding source, registration number and registry name for the systematic review and IPD meta-analysis.	
Introduction			
Rationale	3	Describe the rationale for the review in the context of what is already known.	3
Objectives	4	Provide an explicit statement of the questions being addressed with reference, as applicable, to participants, interventions, comparisons, outcomes and study design (PICOS). Include any hypotheses that relate to particular types of participant-level subgroups.	3
Methods			
Protocol and registration	5	Indicate if a protocol exists and where it can be accessed. If available, provide registration information including registration number and registry name. Provide publication details, if applicable.	4
Eligibility criteria	6	Specify inclusion and exclusion criteria including those relating to participants, interventions, comparisons, outcomes, study design and characteristics (e.g. years when conducted, required minimum follow-up). Note whether these were applied at the study or individual level i.e.	4

		whether eligible participants were included (and ineligible participants excluded) from a study that included a wider population than specified by the review inclusion criteria. The rationale for criteria should be stated.	
Identifying studies - information sources	7	Describe all methods of identifying published and unpublished studies including, as applicable: which bibliographic databases were searched with dates of coverage; details of any hand searching including of conference proceedings; use of study registers and agency or company databases; contact with the original research team and experts in the field; open adverts and surveys. Give the date of last search or elicitation.	4
Identifying studies - search	8	Present the full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	4
Study selection processes	9	State the process for determining which studies were eligible for inclusion.	4
Data collection processes	10	Describe how IPD were requested, collected and managed, including any processes for querying and confirming data with investigators. If IPD were not sought from any eligible study, the reason for this should be stated (for each such study).	4
		If applicable, describe how any studies for which IPD were not available were dealt with. This should include whether, how and what aggregate data were sought or extracted from study reports and publications (such as extracting data independently in duplicate) and any processes for obtaining and confirming these data with investigators.	
Data items	11	Describe how the information and variables to be collected were chosen. List and define all study level and participant level data that were sought, including baseline and follow-up information. If applicable, describe methods of standardising or translating variables within the IPD datasets to ensure common scales or measurements across studies.	4
IPD integrity	A1	Describe what aspects of IPD were subject to data checking (such as sequence generation, data consistency and completeness, baseline imbalance) and how this was done.	4-5
Risk of bias assessment in individual studies.	12	Describe methods used to assess risk of bias in the individual studies and whether this was applied separately for each outcome. If applicable, describe how findings of IPD checking were used to inform the assessment. Report if and how risk of bias assessment was used in any data synthesis.	5

Study characteristics	18	For each study, present information on key study and participant characteristics (such as description of interventions, numbers of participants, demographic data, unavailability of outcomes, funding source, and if applicable duration of follow-up). Provide (main) citations for each study. Where applicable, also report similar study characteristics for any studies not providing IPD.	7-8
IPD integrity	A3	Report any important issues identified in checking IPD or state that there were none.	7
Risk of bias within studies	19	Present data on risk of bias assessments. If applicable, describe whether data checking led to the up-weighting or down-weighting of these assessments. Consider how any potential bias impacts on the robustness of meta-analysis conclusions.	7-8
Results of individual studies	20	For each comparison and for each main outcome (benefit or harm), for each individual study report the number of eligible participants for which data were obtained and show simple summary data for each intervention group (including, where applicable, the number of events), effect estimates and confidence intervals. These may be tabulated or included on a forest plot.	7
Results of syntheses	21	Present summary effects for each meta-analysis undertaken, including confidence intervals and measures of statistical heterogeneity. State whether the analysis was pre-specified, and report the numbers of studies and participants and, where applicable, the number of events on which it is based.	7-9
		When exploring variation in effects due to patient or study characteristics, present summary interaction estimates for each characteristic examined, including confidence intervals and measures of statistical heterogeneity. State whether the analysis was pre-specified. State whether any interaction is consistent across trials.	
		Provide a description of the direction and size of effect in terms meaningful to those who would put findings into practice.	
Risk of bias across studies	22	Present results of any assessment of risk of bias relating to the accumulated body of evidence, including any pertaining to the availability and representativeness of available studies, outcomes or other variables.	7
Additional analyses	23	Give results of any additional analyses (e.g. sensitivity analyses). If applicable, this should also include any analyses that incorporate aggregate data for studies that do not have IPD. If applicable, summarise the main meta-analysis results following the inclusion or exclusion of studies for which IPD were not available.	8-9

Discussion			
Summary of evidence	24	Summarise the main findings, including the strength of evidence for each main outcome.	9-10
Strengths and limitations	25	Discuss any important strengths and limitations of the evidence including the benefits of access to IPD and any limitations arising from IPD that were not available.	10-11
Conclusions	26	Provide a general interpretation of the findings in the context of other evidence.	9-11
Implications	A4	Consider relevance to key groups (such as policy makers, service providers and service users). Consider implications for future research.	9-11
Funding			
Funding	27	Describe sources of funding and other support (such as supply of IPD), and the role in the systematic review of those providing such support.	15

Specification of outcomes and effect measures	13	State all treatment comparisons of interests. State all outcomes addressed and define them in detail. State whether they were pre-specified for the review and, if applicable, whether they were primary/main or secondary/additional outcomes. Give the principal measures of effect (such as risk ratio, hazard ratio, difference in means) used for each outcome.	5
Synthesis methods	14	Describe the meta-analysis methods used to synthesise IPD. Specify any statistical methods and models used. Issues should include (but are not restricted to): • Use of a one-stage or two-stage approach. • How effect estimates were generated separately within each study and combined across studies (where applicable). • Specification of one-stage models (where applicable) including how clustering of patients within studies was accounted for. • Use of fixed or random effects models and any other model assumptions, such as proportional hazards. • How (summary) survival curves were generated (where applicable). • Methods for quantifying statistical heterogeneity (such as I^2 and τ^2). • How studies providing IPD and not providing IPD were analysed together (where applicable). • How missing data within the IPD were dealt with (where applicable).	5-6
Exploration of variation in effects	A2	If applicable, describe any methods used to explore variation in effects by study or participant level characteristics (such as estimation of interactions between effect and covariates). State all participant-level characteristics that were analysed as potential effect modifiers, and whether these were pre-specified.	5-6
Risk of bias across studies	15	Specify any assessment of risk of bias relating to the accumulated body of evidence, including any pertaining to not obtaining IPD for particular studies, outcomes or other variables.	5
Additional analyses	16	Describe methods of any additional analyses, including sensitivity analyses. State which of these were pre-specified.	5-6
Results			
Study selection and IPD obtained	17	Give numbers of studies screened, assessed for eligibility, and included in the systematic review with reasons for exclusions at each stage. Indicate the number of studies and participants for which IPD were sought and for which IPD were obtained. For those studies where IPD were not available, give the numbers of studies and participants for which aggregate data were available. Report reasons for non-availability of IPD. Include a flow diagram.	7

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Figure S1. Location of included studies.

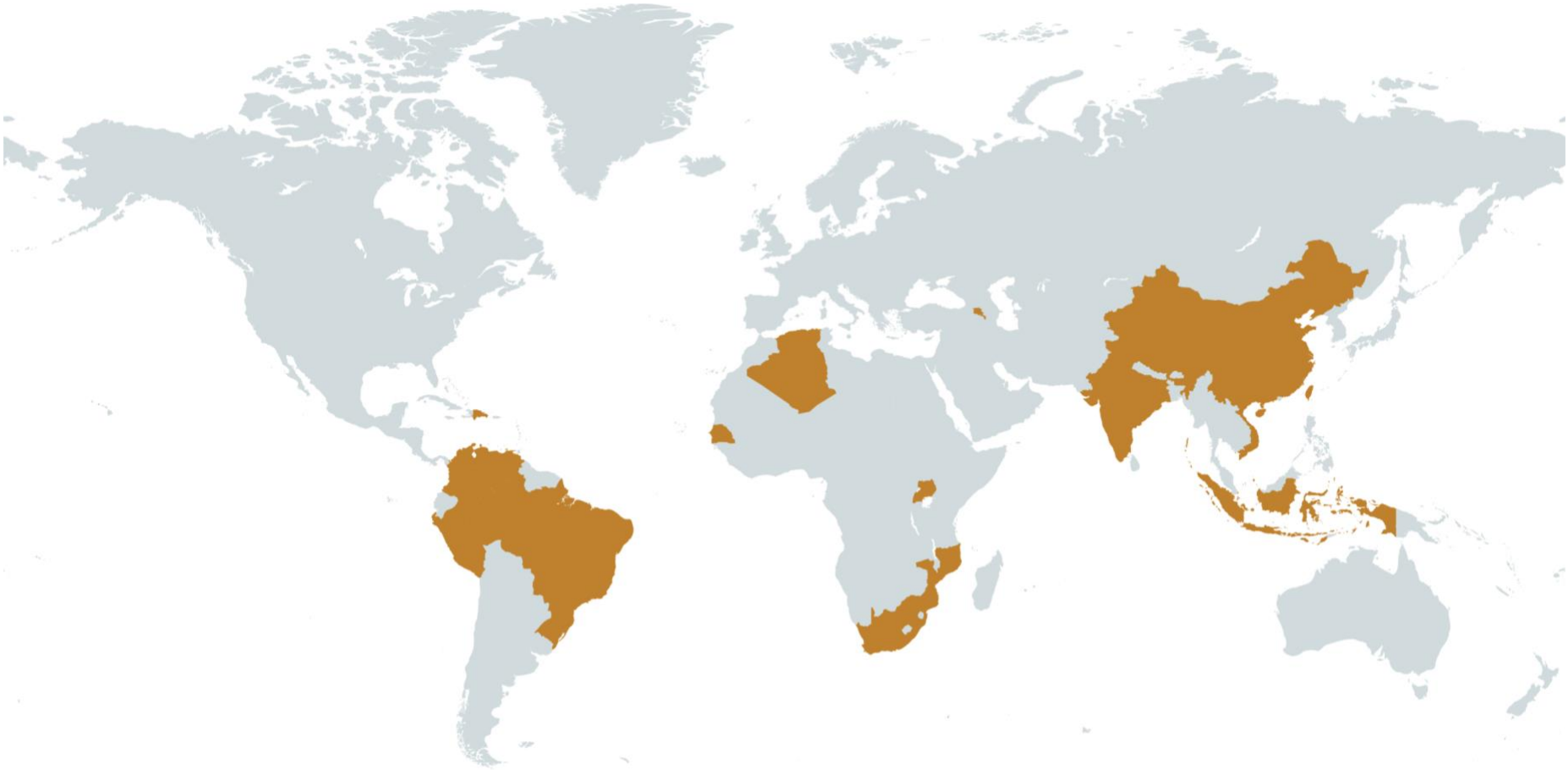

Table. Pulmonary and extrapulmonary tuberculosis and BCG vaccination, adjusted for baseline TST or IGRA status

	Adjusted Odds Ratio	Low 95% CI	High 95% CI
Adjustment for TST or IGRA status			
Pulmonary TB	0.8	0.66	0.97
Extrapulmonary TB	0.73	0.45	1.17

Table. Further adjustment to primary analyses.

	Adjusted Odds Ratio	Low 95% CI	High 95% CI
Further adjustment			
Preventive therapy	0.84	0.69	1
Index HIV status	0.88	0.75	1.02
Index smear status	0.91	0.78	1.07
Index cavitary status	0.89	0.77	1.01
WHO region	0.86	0.77	0.97
Country income status	0.88	0.78	0.99