FII INSTITUTE
Future Investment Initiative Institute

Preventing the Next Global Pandemic

Executive Briefing

Co-written with International Vaccine Institute

FII INSTITUTE
Future Investment Initiative Institute

International Vaccine Institute

Preventing the Next Global Pandemic

The case for financing a global TB vaccine

THE ISSUE AT STAKE

Tuberculosis (TB) is among the world's most lethal diseases, killing 1.4 million people each year, equivalent to more than 80% of the victims of COVID-19 in 2020[1].The majority (66%) of new cases come from 8 developing countries[2], but the threat of a global pandemic is real as cases of drug-resistant TB rise[3] with a 10% increase between 2018 and 2019[4]. As we emerge from the ravages of the COVID-19 pandemic, we must learn from our mistakes and act now to develop an effective TB vaccine before TB brings tomorrow's global health catastrophe.

A LONG-TIME MORTAL FOE

TB is an historic enemy, with mentions of the disease dating back over 4,000 years. In the 19th century, it killed an estimated 25% of Europe's adult population[5]. Still today, about two billion people are infected with the bacterium Mycobacterium tuberculosis[6]. Although most infected people do not develop the disease, it remains an endemic plague with an estimated 10 million people contracting the disease every year[7], and almost one person dying every 20 seconds[8]. Ending TB should be a priority for humanity and was listed among the UN Sustainable Development Goals (SDGs) Health Targets.

TB is especially dangerous for groups with immune deficiencies, such as those suffering from malnutrition or infected with HIV. People infected with HIV and Mycobacterium tuberculosis are 18 times more likely to develop a highly lethal form of TB if not adequately treated[9].

OUR PRESENT VACCINE

BCG (Bacille Calmette-Guérin) is the legacy vaccine against TB, developed in 1921 and preventing the most serious forms of TB, especially for infants and children. It is routinely given at birth in countries most exposed to the disease with an estimated 150 million doses distributed every year[10].

BCG dramatically helped curb TB in the 20th century and remains mandated in several Eastern European countries, in Asia, and in parts of Africa.

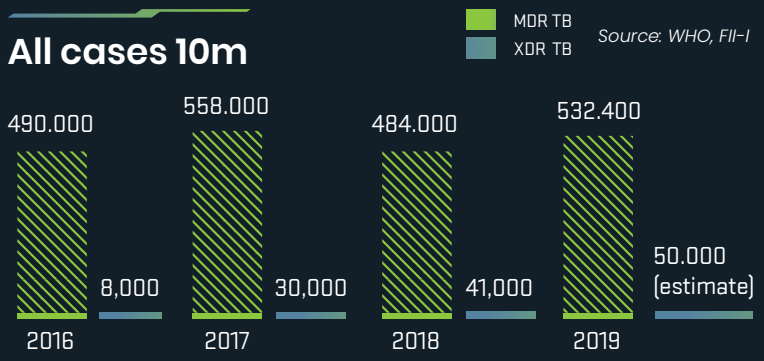
However, BCG does not provide efficient protection in all circumstances. For infants and children, it reduces the risk of contracting TB by no more than half[11], while modern vaccines are expected to reach up to 90% efficacy. Moreover, the present vaccine confers even more limited immune protection as people grow up: it protects infants and children against severe disease after they contract TB, but the effect wanes in adolescents and adults[12].

Several alternative vaccines to BCG are under development, including those designed to offer greater protection for adolescents and adults where most of them have reached late development phases with near-term completion anticipated[14].

THE CASE FOR FINANCING A GLOBAL TB VACCINE

As we celebrate the 100th anniversary of the BCG vaccine, we have an opportunity to reflect on the future challenges we face. Today, the emergence of Multi-Drug-Resistant (MDR) TB is a healthcare threat of global proportions, accounting for up to a third of newly detected cases in some countries[15]. Extensively-Drug Resistant (XDR) TB is also emerging, which poses an even greater threat because it is much more difficult and takes much longer to cure. These more dangerous TB variants impose a significant burden on societies and communities where the disease is endemic. Achieving the WHO goal to end TB by 2035 is impossible without new vaccines to complement our arsenal of drugs and diagnostics and tackle these rising threats.

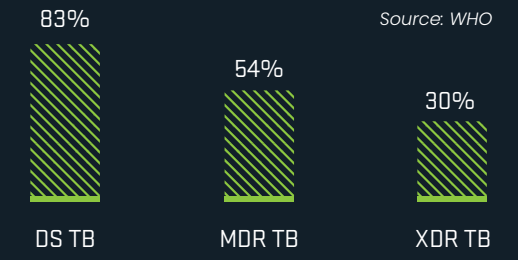
Estimated number of Multi-Drug Resistant and Extensively-Drug Resistant (XDR) TB cases per year



Bacterial drug-resistance occurs when treatment protocols are not adequately followed or stopped before infection is eliminated, allowing the disease time to adapt to and withstand the treatment[16]. Resistant pathogens require complex treatments and spread like regular drug-susceptible (DS) strains, resulting in more dangerous epidemics.

Chances of successful TB Treatment

The Multi-Drug Resistant TB epidemic is gaining momentum in many countries, representing up to 35% of new TB cases in Russia, for example[17]. Moreover, strains of XDR TB have been detected in 123 countries, and it is likely to be underreported[18]



Progression of MDR TB cases among new TB cases, selected countries

Source: WHO

	2013	2014	2015	2016	2017	2018	%
Estonia	/	19%	16%	14%	/	22%	%3+ pts
Ukraine	/	22%	/	27%	/	29%	%7+ pts
Rus. Fed.	22%	/	/	27%	/	35%	%13+ pts
Kazakhstan	26%	/	25%	26%	/	27%	%1+ pts

INACTION VS PREVENTION: THE PRICE OF DELAY

USD 16,700 bn (cumulative 2015 - 2016)

An MDR TB epidemic would have disastrous consequences for the world: combining lives lost, cost of treatment, and productivity losses, it could cost the world economy up to **USD 16.7 trillion** by 2050 (cumulative since 2015)[19]. The economic and social impact of a pandemic would be particularly harsh for developing countries: in one survey of people with MDR TB in Ethiopia, 72% of respondents reported losing their jobs[20].

USD 1.3 bn (yearly, for 5 years)

Prevention can save trillions of dollars[21]. The funding needed for research and development of a new vaccine, new diagnostic tools, and drugs is USD 13 bn (cumulative) over five years, on top of USD 65 bn for prevention and care over the same period[22]. Presently, the amount required to close the funding gap for TB-related research and development is only **USD 1.3 bn annually**[23].

CALL FOR ACTION

TB could create tomorrow's global pandemic. The threat is all the more imminent as it is an endemic, airborne, highly infectious disease, able to spread in dense urban environments. As the world recovers from COVID-19, travel will rebound and urban density will increase, providing a fertile ground for the spread of infectious diseases, including TB.

Just like COVID-19, TB is an ongoing pandemic that risks becoming even worse as new MDR / XDR strains spread globally. An MDR TB pandemic would have catastrophic consequences for the world, shutting down economies and likely killing millions of people. Yet, this can be mitigated at a comparably low financial cost, as the funding gap for TB-related research and development is only USD 1.3 bn annually.

Meanwhile, the TB vaccine field has seen unprecedented efficacy signals in clinical trials over the last years. According to the International AIDS Vaccine Initiative, 15 vaccines are presently in the pipeline, including 3 at advanced stages. This provides a strong basis to further develop vaccine approaches and expand our knowledge of TB vaccines. Continued investment in vaccines will allow us to overcome the remaining obstacles to the development of an improved TB vaccine.

We therefore call for urgent action to fast-track the development of preventive measures against TB, while supporting relief efforts in the countries devastated the most by the disease.

	Description	Proposition
USD 1.3 bn per year would save countless lives and prevent a loss of up to USD 16,700 bn from the impacts of TB by 2050.	Securing the adequate funding for TB-related research and development is of utmost importance.	Bridge the USD 1.3 bn yearly funding gap for research and development on TB prevention, diagnosis, and treatment.
Public-private cooperation frameworks should be created for efficient research.	The uncertainty about the outcomes of TB research is a barrier to the involvement of private actors, despite valuable market needs. Public actors can mitigate this barrier with push (e.g. grants to finance high-risk developments) and pull (e.g. increasing commercial reward) mechanisms[25].	Encourage public-private cooperation in TB research and development. Promote efficient vaccine development. (e.g. rationally designed vaccines).
International cooperation can optimize research costs and output.	TB is a threat to both developed and developing countries. Knowledge sharing and access to samples and data should be ensured, in the example of the cooperation within the Global TB Vaccine Partnership GTBVP.	Achieve synergies and improve cost efficiency though the cooperation of international researchers and sharing of knowledge and discoveries. Leverage the R&D infrstructure created for COVID-19 to support the TB R&D.
Existing pathways for vaccination can be leveraged to roll out TB vaccination programs at lower costs.	Billions of dollars were invested in rolling out comprehensive vaccine distribution platforms, that serve adults and adolescents as well as children. This is an opportunity to create synergies with vaccination for TB once a new vaccine is available.	Leverage the existing logistical platforms to enable widescale TB vaccine distribution program at a lower cost.

ABOUT THE AUTHORS

Lameen Abdul-Malik
Director of THINK

Awarded the Nobel Peace Prize with the International Atomic Energy Agency (IAEA) in 2005 where he worked for over 14 years, Lameen has over 20 years' experience in international development, primarily in Africa. He considers one of his greatest achievements managing a project to help Zambia treat over 1,500 cancer patients annually.

Lameen is the Director of Think at the Future Investment Initiative (FII) Institute, where he oversees and guides the selection and curation of ideas that will alleviate global societal challenges.

FII Institute: new generation of global foundation

The FII Institute is a next generation global foundation working to ensure the world's brightest ideas find their way to build, scale and create positive sustainable impacts on humanity. With an ambitious vision to empower the brightest minds to shape a better future for all, the FII Institute brings together global leaders and experts to collectively curate and enable concrete ideas that can solve today's most pressing societal issues and create long term platforms to reshape the future of humanity sustainably. FII partners with leading institutions around the world in the public, private, and non profit sectors to harness, connect, and promote impactful ideas on areas including healthcare, sustainability, AI, and robotics.

Jerome H. Kim
Director General of IVI

Jerome Kim, M.D., is an international expert on the evaluation and development of vaccines and is the Director General of the International Vaccine Institute, whose mission is to discover, develop and deliver safe, effective and affordable vaccines for Global Health. Prior, he was the Principal Deputy, US Military HIV Research Program and led the Army's Phase III HIV vaccine trial that showed modest efficacy in the prevention of HIV-1 infection.

Dr. Kim is also an Adjunct Professor, Department of Medicine, Uniformed Services University and at the Graduate School of Public Health, Yonsei University. He has authored over 300 publications.

International Vaccine Institute: accelerating vaccines for global health

The International Vaccine Institute (IVI) is a non profit international organization established in 1997 at the initiative of the United Nations Development Programme (UNDP). IVI has 36 signatory countries and the World Health Organization (WHO) on its treaty, including the Republic of Korea, Sweden, India, and Finland as state funders. The IVI's mandate is to make vaccines available and accessible for the world's most vulnerable people. The IVI focuses on infectious diseases of global health importance such as cholera, typhoid, shigella, salmonella, schistosomiasis, chikungunya, group A strep, Hepatitis A, HPV, TB, HIV, MERS, COVID 19 as well as antimicrobial resistance.

Contact

- **FII Institute: Director of THINK (content)**
  lameen.abdulmalik@fii-institute.org
- **FII Institute: Director of Xchange (publication)**
  manal.elmeligi@fii-institute.org
- **FII Institute: Director of Communications**
  talal.bawazir@fii-institute.org
- **IVI: Director General**
  jerome.kim@ivi.int
- **IVI: Head of Global Affairs & Communications**
  youngmi.cho@ivi.int

REFERENCES

1 - WHO (2019)

2 - WHO (2019): India, Indonesia, China, Philippines, Pakistan, Nigeria, Bangladesh, South Africa

3 - WHO (2020)

4 - WHO (2020)

5 - British Journal of Medicine Practitioners (2013)

6 - WHO (2019)

7 - WHO (2019)

8 - WHO (2019)

9 - WHO (2020)

10 – UNICEF (2015)

11 - G A Colditz et al. (1995)

12 - P. Mangtani et al., (2014)

13 - Roy et al, The Lancet Global Health (2019)

14 - Tuberculosis vaccine institute (2020)

15 - WHO (2019)

16 – Conservation – based on 2018 ratio XDR / MDR TB

17 - Wood, Alastair J.J.; Iseman, Michael D. (1993)

18 - WHO (2018)

19 - WHO (2016)

20 – All Party Parliamentary Group on Global Tuberculosis (2015)

21 - van den Hof S, Collins D, Hafidz F, et al. (2016)

22 - Stop TB Partnership (2018)

23 - Stop TB Partnership (2018)

24 – WHO (2018) / Stop TB Partnership (2018)

25 - Ozawa et al, Health Affairs (2016)

26 - TBVI (2013)