



## Tuberculosis, the unsung infectious disease

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The battle against tuberculosis has a long history with many heroes. The first hero of tuberculosis is Robert Koch, who in 1882 was the first one to identify *Mycobacterium tuberculosis* as the causative agent of what previously believed to be a genetic disease. He was awarded the Nobel prize in physiology and medicine 23 years after his initial discovery [1]. Other heroes from the early years are Paul Ehrlich, Albert Calmette, Camille Guérin, and Charles Mantoux. There are many, many more unsung heroes. The term “unsung hero” is used to describe someone (or something) who does great deeds but receives little or no recognition for that. Within medicine, the term has been used with reference to certain professions within health care (such as nurses), but also for diseases, cell types, or molecular mechanisms. Since 2004, the Stop TB Partnership awards the Kochon Prize to the unsung heroes of tuberculosis [2]. Recent winners include the Asociación de Personas Afectadas por Tuberculosis del Perú (2015), Speranta Terrei, a Moldovan patient support organization (2016) and the Indian Council of Medical Research (2017).

The recognition and awareness of a certain disease can also be measured by its representation in various art forms. Several major pieces of art deal with tuberculosis including Victor Hugo's *Les Misérables*, Giuseppe Verdi's *La Traviata* and Giacomo Puccini's *La Bohème*. During those times, tuberculosis even has been termed a “romantic disease” [3].

For an analysis of the representation of tuberculosis in modern culture, an analysis was made of the occurrence of the term “tuberculosis” in the lyrics of modern music, as compared to other infectious diseases. To that end the [Lyrics.com](https://www.lyrics.com/) database was used (<https://www.lyrics.com/>), which according to their own information, is the web's largest resource for music, songs and lyrics.

In absolute terms, AIDS (746) and influenza (592) are most often used in song lyrics. There are only 44 songs about tuberculosis (including 17 on T.B.; see below). When the number of songs are expressed relative to the prevalence of the disease, the situation is even more extreme. Now Ebola by far is the disease that is used most. Ebola has an over 200-fold higher relative frequency than the number 2 in the list (influenza) and 200,000-fold higher than tuberculosis. Tuberculosis is at the very bottom of this list (Fig. 1).

In popular language, and therefore also in popular music, a given disease can have multiple names. Influenza is also referred to as flu,

tuberculosis as T.B. and AIDS in itself already is an abbreviation. When searching for abbreviations in song lyrics, care should be taken to verify the correct (disease) context. Lyrics with AIDS thus were corrected for Band-Aids and Kool Aid. The abbreviation T.B. has 111 meanings, including trombone (frequently contaminating Glenn Miller lyrics) and Taco Bell. After correcting for those irrelevant abbreviations, in the overview of songs about diseases, influenza and flu as well as tuberculosis and T.B., were combined under the same heading.

The vast majority of the songs included in the [Lyrics.com](https://www.lyrics.com/) database are in the English language, but it also includes songs in French, German, Spanish, and Italian. This allowed the comparison of the frequency of tuberculosis in the major languages of the world. When expressed relative to the word “heart” (“Coeur” F, “Herz” G, “Corazon” S, “Cuore” I), German stands out with a ratio of 0.69, as compared with 0.24 for English lyrics, and 0.07 for Spanish lyrics. It can only be speculated about the reasons for the relative frequent use of tuberculosis in German songs but it could be related to the work of Robert Koch, who discovered the cause of tuberculosis, and the subsequent development of treatment and prevention modalities [1].

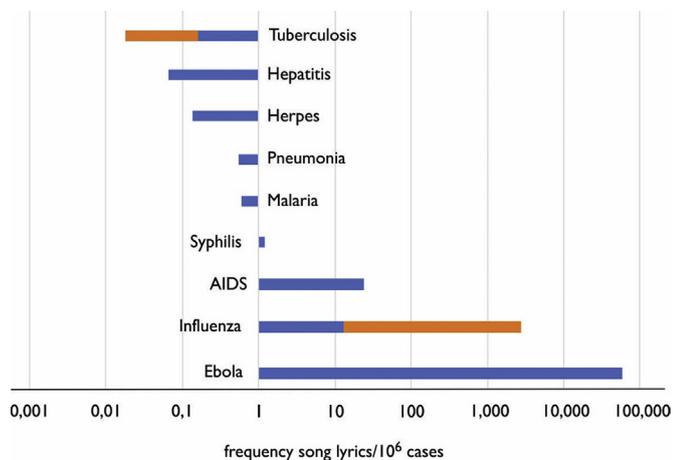
The underrepresentation of tuberculosis, as compared to other infectious diseases, in modern music underscores the need of having an annual World Tuberculosis Day. A disease doesn't disappear by ignoring its existence. In the 1930's and 40's blues musicians like Ledbelly, Jimmie Rodgers (who died himself of tuberculosis) and Sonny Terrell and Brownie McGee have sung about T.B. The message was grim: “I'm fightin' like a lion, looks like I'm going to lose” or “Everybody knows, T.B. is killing me” [4]. At that time, tuberculosis was a fatal disease with no treatment options [5]. Nowadays, T.B. doesn't need to be fatal, providing that access to appropriate medication is available. Prevention by means of vaccination will require novel and better vaccines than currently available [6,7]. For the foreseeable future, that is until 2035, the WHO aims to End TB [8,9]. Until that time, tuberculosis will not be a disease of the past. Therefore, not just health care workers, but everybody in society, including musicians can contribute to raise awareness of tuberculosis.

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**Fig. 1.** Frequency of song lyrics containing a specific disease relative to the global prevalence of corresponding disease. For influenza and tuberculosis, the formal and common name (flu and T.B., respectively) are added. Common disease names in orange bars. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

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