In 2018, 1.5 million deaths were attributed to tuberculosis (TB), which was more than any other single infectious disease.

Drug-resistant TB has increased in prevalence over the years, and strains resistant to all forms of treatment have begun to emerge across the globe.

There is a lack of agreement of how to classify this form of TB.

The cost of creating a new antibiotic is estimated to be as high as $2.5 billion US dollars.

### BACKGROUND

- Literature search conducted in PubMed and Scopus.
- Terms included those in Table 1, as well as those terms regarding risk factors.
- Articles excluded if:
  - not in English
  - published before June 2010
  - does not use one of the terms listed in Table 1
- Has less than 10 patients with resistance to all forms of treatment/ less than 10 patients with a poor treatment outcome (failure, default, or death) despite having been on a treatment regimen.

### OBJECTIVE

Considering the enormity of the threat of incurable drug-resistant tuberculosis, there is an urgent need to understand what places individuals at-risk for this disease.

My primary research question was: **What are the risk factors for incurable drug-resistant tuberculosis?**

### METHODS

- Literature search conducted in PubMed and Scopus.
- Terms included those in Table 1, as well as those terms regarding risk factors.
- Articles excluded if:
  - not in English
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### RESULTS

A history of tuberculosis

Untreated HIV

Being a smoker

Middle-Aged

Male

Most frequently reported risk factors

- Being unemployed
- Being a former prisoner

Mixed or limited evidence for: treated HIV, other comorbidities, alcoholism, being a migrant, education, rural/urban status

### DISCUSSION

- The fact that all 16 studies had individuals with incurable drug-resistant TB who previously underwent treatment for TB indicates that there is a dire need to increase patient adherence to TB treatment.

This will require:
- Scaling up of currently existing TB treatment-programs
- Linking mental health care with TB treatment programs
- Removing financial and logistical barriers for patients
- Stigma-reduction campaigns
- Prevention of incurable drug-resistant TB will also require:
  - Linking HIV care with TB care for co-infected patients
  - Increasing access to TB treatment in prisons, and ensuring that prisoners remain on treatment after being released.
  - Raising awareness about the link between smoking and tuberculosis mortality

- Additional recommendations:
  1. More studies to determine if comorbidities (other than HIV) increase risk.
  2. More studies on incurable drug-resistant TB to be conducted in Russia & India: 2 countries with some of the highest rates of DR-TB.
  3. More standardization in the literature through consistent usage of the following 2 terms & abbreviations to describe the highest levels of drug-resistance:
     - Extra-extensively drug-resistant tuberculosis (XXDR-TB)
     - Incurable drug-resistant tuberculosis (IDR-TB)

**Limitations:** There was only a single reviewer, with only 2 databases searched. Furthermore, inconsistencies of reporting of results in studies led to issues in making comparisons between studies. Lastly, there were difficulties in determining temporality for many modifiable risk factors.

### Table 1: Terms used in the literature for most resistant forms of TB

<table>
<thead>
<tr>
<th>Term</th>
<th>Associated abbreviations</th>
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<tbody>
<tr>
<td>Extensively drug-resistant tuberculosis</td>
<td>XDR-TB, XDRTB, XDR TB</td>
</tr>
<tr>
<td>Extra extensively drug-resistant tuberculosis</td>
<td>XXDR-TB, XXDRTB, XXDR TB</td>
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<td>Extremely drug-resistant tuberculosis</td>
<td>TXDR-TB, XTDRB, TXDR TB, TXDR TB, XTDRB, TXDRB, TXDRB</td>
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<tr>
<td>Incurable drug-resistant tuberculosis</td>
<td>Incurable DRTB</td>
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<tr>
<td>Incurable tuberculosis</td>
<td>None</td>
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<tr>
<td>Pan drug-resistant tuberculosis</td>
<td>PDR-TB, PDRTB, PDR TB</td>
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<tr>
<td>Pan-resistant tuberculosis</td>
<td>None</td>
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<tr>
<td>Total drug-resistant tuberculosis</td>
<td>TDR-TB, TDRTB, TDR TB</td>
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<tr>
<td>Totally drug-resistant tuberculosis</td>
<td>TDR-TB, TDRTB, TDR TB</td>
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<tr>
<td>Untreatable drug-resistant tuberculosis</td>
<td>None</td>
</tr>
<tr>
<td>Untreatable tuberculosis</td>
<td>None</td>
</tr>
</tbody>
</table>

16 Studies from 11 countries:
5 from South Africa, 4 from China, 2 from Latvia, 1 from: India, Pakistan, Russia, Brazil, Lithuania, Estonia, Romania and Georgia.