Connecting the DOTS: Smoking, HIV, and TB
In Rio de Janeiro, Brazil
Conflict of Interest Statement

I am a US Government employee and have no conflict of interest regarding this presentation. Further, the presentation does not represent US Government policy as it is provided solely in my previous academic capacity as Professor Emeritus of Public Health at San Diego State University.
SYNDEMIC

• Aggregation of two or more diseases in a population;
• Positive bio-social interaction that increases the negative health effects of all the diseases;
• Interactions between HIV-TB-smoking must be better understood.
Social Determinants of TB and smoking are similar

- 95% of TB deaths in LMIC
- 80% of smoking deaths in LMIC
- High-income countries:
  - Decline in TB
  - Decline in smoking
  - Increase in living standards

“Treatment programmes have not had a major, detectable effect on incidence on a large scale.”

“DOTS programmes are relatively weak determinants of TB trends in many countries, with effects that are obscured by other, stronger biological, social and economic factors.”

Figure 3. Forest plot of results for men only and for men and women combined in studies^4,17,19-28 that examined smoking and tuberculosis disease. The smoking type (ex-smokers [Ex], current smokers [Current], and ever smokers [Ever]) of the study population is shown on the y-axis.
Tobacco & Tuberculosis

Mortality

# Population Attributable Mortality Comparisons in Persons with TB

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>RR if factor present</th>
<th>Prevalence of factor</th>
<th>Population attributable risk*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malnutrition</td>
<td>3.0</td>
<td>17%</td>
<td>25%</td>
</tr>
<tr>
<td>Smoking</td>
<td>2.6</td>
<td>18%</td>
<td>23%</td>
</tr>
<tr>
<td>Alcohol use (&gt;40g/d)</td>
<td>2.9</td>
<td>7.9%</td>
<td>13%</td>
</tr>
<tr>
<td>HIV</td>
<td>8.3</td>
<td>1%</td>
<td>7%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>3.0</td>
<td>3.4%</td>
<td>6%</td>
</tr>
</tbody>
</table>

* Proportion of disease eliminated in absence of risk factor
Current smoking prevalence (%), Brazil, 1989-2013

Population ≥ 15 years old

<table>
<thead>
<tr>
<th>Year</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989</td>
<td>30%</td>
</tr>
<tr>
<td>2001</td>
<td>21%</td>
</tr>
<tr>
<td>2003</td>
<td>17.5%</td>
</tr>
<tr>
<td>2013</td>
<td>14.7%</td>
</tr>
</tbody>
</table>

Source: INCA – MoH Brazil
Smoking prevalence and TB in Rio de Janeiro

Among TB patients (DOTS)\(^1\):

<table>
<thead>
<tr>
<th>Year</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>52%</td>
</tr>
</tbody>
</table>

Smoking and alcohol\(^2\): Two additional risk factors associated with TB mortality

IPEC Cohort, HIV-positive Persons (Torres et al., 2014)

• Smoking prevalence:
  – Current: 29.9%
  – Former: 23.9%

• Adjusted OR for TB, Current vs. Never Smokers among HIV-infected: 1.45 (95% CI 1.17–1.81)

• AIDS-related infection mortality: TB is the most common cause (149/412, 36%)
Importance of HIV-TB-Smoking Syndemic in Brazil

• TB is the main cause of infectious disease death for HIV-infected persons in Brazil;

• TB incidence in Rio de Janeiro is 70.3/100,000 (2010);

• Tobacco use is associated with higher TB mortality, non-adherence to anti-TB drugs, TB infection.

• Passive smoking may also increase TB spread;
Questions on the Tobacco-TB-HIV Syndemics

- Does smoking cessation improve TB treatment outcomes (smear conversion time, relapse rate)?
- Does a smoking cessation program in TB treatment improve smoking cessation?
- Does smoking cessation decrease TB spread among household members and the community?
- Does pharmacotherapy for cessation interfere with TB meds?
- Does smoking cessation impact HIV/AIDS treatment and prevention outcomes?
The effects of tobacco use on TB outcomes are independent of the effects of alcohol use, SES, age, sex and other potential confounders.

<table>
<thead>
<tr>
<th>Exposure to tobacco</th>
<th>Outcome</th>
<th>Risk ratios</th>
<th>Strength of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active/passive</td>
<td>TB infection</td>
<td>1.03 to 3.2</td>
<td>Limited</td>
</tr>
<tr>
<td>Active</td>
<td>TB disease</td>
<td>1.01 to 6.3</td>
<td>Strong</td>
</tr>
<tr>
<td>Passive</td>
<td>TB disease</td>
<td>1.6 to 9.3</td>
<td>Strong</td>
</tr>
<tr>
<td>Active</td>
<td>Recurrent TB</td>
<td>2.5 to 3.1</td>
<td>Moderate</td>
</tr>
<tr>
<td>Active</td>
<td>Mortality</td>
<td>1.02 to 6.6</td>
<td>Limited</td>
</tr>
</tbody>
</table>

Source: WHO/The Union (2007) *Monograph on TB and Tobacco Control*
DOTS and HIV care involves regular provider-patient contact

TB/HIV visits provide a “teachable moment”

Smoking adversely affects TB treatment, progression, household spread, and mortality
### Improved TB management should include intensive smoking cessation counseling and referral;

- Cessation training is needed for all staff of primary health care centers;

- Specific educational materials should be developed on the harmful interactions between smoking, HIV, and TB;

- The health record and surveillance forms for TB and HIV should include detailed data on smoking;

- *Agentes* and providers need to assure that patients and families participate in and complete the smoking cessation programs.
Proposed Study Aims

1. Conduct background work in order to fully develop the proposed novel intervention;
2. Refine the intervention to be tested in a future Randomized Control Trial;
3. Test the research framework for an Integrated TB, HIV, and Tobacco Control trial.
Potential Policy Implications for Brazil (and Global)

• Establish surveillance system for tobacco use among TB and HIV/AIDS patients;
  – Further research on tobacco interaction with TB and HIV in Brazil;

• ACTIVELY provide referral, counseling, and tobacco pharmacologic treatment to all TB and HIV/AIDS patients as part of treatment protocols;

• Involve family, community, and health center teams in tobacco control.
Future Study Design

2 components

Formative Work

- Training of providers, staff and *agentes*:
  - On tobacco effects on TB and HIV
  - Smoking Cessation Counseling skills.
  - Baseline questionnaire smoking KAB, ability to provide cessation counseling

- Post-training KAB assessment
- Six-month KAB assessment and focus group on feasibility of trial.

Pilot Intervention

- Baseline questionnaire: smoking KAB, intention to quit, understanding of tobacco use impact on TB and HIV
- Cessation motivation
- Home visit support for cessation
- Surveillance system for tobacco use

- 3-month follow-up questionnaire: smoking KAB, intention to quit, utility of program, knowledge of tobacco use impact on TB and HIV
- Semi-quantitative urinary cotinine testing to ascertain quit status
- Evaluation of surveillance system
Conclusions

• Smoking may increase risk for TB mortality, morbidity, and household spread
• Counseling in TB/HIV treatment will likely increase smoking cessation among TB/HIV patients
• Specific training is needed for TB/HIV program providers to provide cessation
• TB/HIV treatment programs should incorporate tobacco control as critical element
Conclusions

• Integrating Tobacco Control into TB/HIV treatment requires creativity, persistence, training, incentives, and careful M & E: MORE THAN JUST CESSATION

• Syndemic and systemic approaches needed:
  – Modeled after HIV and TB co-infection approach
  – Health systems integration/community involvement
  – Standard of TB and HIV care to include tobacco control

• Cooperative global approach to research and training needed
WHO and The Union Recommendations:
Incorporate brief advice on smoking cessation in TB treatment programs

A WHO / The Union Monograph on TB and Tobacco Control

Joining efforts to control two related global epidemics
Thanks!

Especially to collaborators at FIOCRUZ, Federal University of Rio de Janeiro, and the Municipal RJ Health Department
Pharmacotherapy for Cessation: Impact on TB Treatment?

- Nicotine patches, gums, lozenges OTC
- Inhaler and spray (Nicotrol) by prescription
- Harm reduction with new tobacco products?
- Varenicline (Chantix): Blocks effects of nicotine in brain (agonist)
- Bupropion (Wellbutrin, Zyban): antidepressant
Does stopping smoking decrease TB mortality risk?

- Taipei (Taiwan) cohort of 486,431 adults followed from 1994-2007
- 15,268 deaths, 77 from TB
- Hazard Ratio=8.56 for smokers vs non-smokers without prior history of TB
- After quitting, risk of death from TB reduced by 65%
- (37.7% of TB mortality in Taiwan accounted for by smoking [PAR])

TB and HIV Co-infection

- One-third of people living with HIV worldwide are infected with TB
- Approximately 20% of deaths among people with HIV are due to TB
- In 2012 there were 1.1 million new cases of HIV-positives with TB, 75% live in Africa.
- Prevalence of cigarette smoking is higher among people living with HIV compared to general population