Children as Sentinels for Transmission and Policy Response

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Overview

- Burden of DR-TB in children
- Concept of children as sentinels
- Propose targets to guide intervention and inquiry
BURDEN OF DR-TB IN CHILDREN
What is the global burden of pediatric DR-TB?

Rates = # cases per 100,000 children?
## Counting children: comparing reporting for paediatric HIV and tuberculosis

Philipp du Cros, Bern-Thomas Nyang‘wa, Marianne Gale, Sarah Venis & Nathan Ford

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<th>Estimates</th>
<th>HIV</th>
<th>TB</th>
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<td>Burden</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>Numbers on treatment</td>
<td>YES</td>
<td>Yes*</td>
</tr>
<tr>
<td>Treatment gap</td>
<td>YES</td>
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<tr>
<td>Prevention gap</td>
<td>YES</td>
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* Unreliable since most notified cases are smear +
October 2012 report first to include childhood TB burden estimates

~ 490,000 cases per year

Others have estimated burden could be twice as high (Newton et al 2008)

All estimates rely on data that cannot reflect reality of child TB, e.g.

- Case notification data skewed to smear-positive diagnoses, but most child cases smear-negative
- Prevalence surveys exclude children (< 15 years old)
<2% of all patients included in Global DR-TB Surveillance data over 10 years were children.
## Counting children: comparing reporting for paediatric HIV and tuberculosis

Philipp du Cros, a Bern-Thomas Nyang’wa,a Marianne Gale, b Sarah Venis a & Nathan Ford a

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Recipe to make children with DR-TB invisible

Man-made frame:
priority assigned to smear-positive cases

Nature of disease:
definitive (bacter.) diagnosis less likely than adults

Very difficult to confirm DR-TB
AND
to estimate burden
CHILDREN AS SENTINELS
CHILDREN AS SENTINELS

FACT: Children infected with *M. tb* progress more quickly to disease (and death) than do adults
How Much Tuberculosis in Children Must We Accept?

ALAN B. BLOCH, MD, MPH
DIXIE E. SNIDER, JR., MD, MPH

AJPH January 1986

society. The occurrence of disease in children, particularly children under age five, is perhaps the best indicator that tuberculosis patients are causing infection and disease not only in children, but also in persons of all ages. For this reason, tuberculosis in children may be defined as a sentinel health event—a preventable disease whose occurrence serves as a warning signal that the quality of preventive and/or therapeutic medical care may need to be improved. Just as illness in canaries who accompanied coal miners into the shafts foretold of impending danger, so too the occurrence of tuberculosis in children is a harbinger of continued risk to all. Unless we intervene, thousands of future cases will arise from the reservoir of persons currently infected.
Every single child with DR-TB is a source of information

- Very likely reflects recent transmission of DR-TB
- Very likely there is an identifiable infectious source nearby (most often in household)
- Points to gaps in practice, programs, policy, tools, science
Six case reports of pediatric XDR-TB, so far…

- 2008: Lima, Peru
- 2009: California, USA
- 2010: Tugela Ferry, South Africa
- 2011: Mumbai, India
- 2011: Beijing, China
- 2012: Thessaloniki, Greece

Banerjee et al 2008
Del Castillo et al 2009
Thomas et al 2010
Liu et al 2011
Shah et al 2011
Katragkou et al 2012
Children treated for MDR-TB
~ 400 in 9 countries (~ half by Schaaf team in Cape Town, SA)

- Pinon et al 2010
- Isaakidis et al 2011
- Ettehad et al 2012
- Hurtado et al 2012
- Satti et al 2012
- Amanullah et al 2012

>80% cured, even with HIV co-infection
Systematic review:
Identified studies in 42 countries that found children with INH-resistant TB
Sentinel Project on Pediatric DR-TB

• Idea born at April 2011 Delhi workshop of this series
• Goal: to collaborate to build and deploy knowledge to end child deaths from DR-TB
• October 2011 launch of virtual (on-line) network: today >200 members in >50 countries
• Task forces tackling joint projects to: raise visibility, share best practices, set scientific agenda, set targets and monitor gaps

www.sentinel-project.org
Sentinel Project network collecting stories of individual children: from 16 countries by March 2013
Management of Multidrug-Resistant Tuberculosis in Children: A Field Guide

Caring for Children with Drug-Resistant Tuberculosis
Practice-based Recommendations

James A. Seddon1-2, Jennifer J. Furin3, Marianne Gale4, Hernan Del Castillo Barrientos5,6, Rocio M. Hurtado2,8,9, Farhana Amanullah10, Nathan Ford11, Jeffrey R. Starke12, and H. Simon Schaaf1,13; on behalf of the Sentinel Project on Pediatric Drug-Resistant Tuberculosis

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Am J Respir Crit Care Med  Nov 15, 2012
TARGETS TO GUIDE INTERVENTION AND INQUIRY
Children with DR-TB can also serve as sentinels for our policy response. How?

Let’s set targets to find and cure them.
What DO we know? (1)

Child contacts in DR-TB patient households
• have very high risk of disease in first year after DR-TB patient identified
• have similar risk of TB disease as adults, and >30 times risk in children in general population

Schaaf et al PIDJ 1999
Schaaf et al Pediatrics 2002
Becerra et al Lancet 2011
Vella et al IJTLD 2011
Becerra et al PIDJ 2012
What DO we know? (2)

• Household contact tracing is a global public health standard \(\text{\textcolor{blue}{(International Standards for Tuberculosis Care, 2006)}}\)

• Screening household contacts found 15 times as many TB cases than screening community \(\text{\textcolor{blue}{(Shapiro et al Am J Respir Crit Care Med 2012)}}\)

• Vast delivery gap in screening child contacts \(\text{\textcolor{blue}{(Hill et al PLoS Med 2011)}}\)

If we want to find more children with DR-TB, we must look in DR-TB patient households.
Multiply by disease risk: 2.5%

~660,000 MDR-TB patients, 2011
( WHO 2012 )

Target 1: number of children to evaluate
~ 1,260,000

Multiply by latent infection risk: 25%

Target 3: number of children at high risk for disease
~ 315,000

Target 2: number of children with disease
~ 31,500

Becerra & Swaminathan, J Public Health Policy, in press.
Conclusions

• Global burden of pediatric DR-TB is invisible… and no easy solution
• Alternative: build on concept of child cases as sentinels
• Let’s use pediatric targets to forge a new policy response to DR-TB