2013 2014

HIV

New global strategies for the treatment of HIV and Tuberculosis

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HIV and tuberculosis remain a major public health challenge in parts of
sub-Saharan Africa and Asia. This study used new epidemiological techniques to assess the strategies
being used for HIV control in sub-Saharan Africa. Data from the Demographic and Health Surveys (DHS) for
32 sub-Saharan African countries between 2000 and 2012 was analyzed using spatio-temporal regression to
identify trends in HIV testing, and the trends compared against target rates of testing required to
achieve elimination of new HIV infections by 2020. The study found that of the 32 countries, only 9 have
exceeded the 2012 testing rate target, and one third of the countries are statistically significantly
below this threshold, indicating that they are far below the level of testing coverage required to
achieve HIV elimination. New and more effective strategies are needed in sub-Saharan Africa to achieve
elimination and disease control goals.

Tuberculosis and HIV infection present a growing burden of disease globally, especially in sub-Saharan countries and in countries with fragile health systems (Corbett 2003). The growth of drug resistance presents profound problems for countries with HIV or tuberculosis epidemics, and especially where both diseases exist (Gler 2012)

Current treatment strategies for tuberculosis, such as DOTS, and treatment-as-prevention strategies for HIV such as highly active antiretroviral therapy (HAART) require complex interventions and robust health systems in order to both maintain their effectiveness and prevent the growth of drug resistance. Previous research has shown that testing-and-treatment strategies for HIV can be effective and cost-effective in epidemic environments such as China (Li 2012) and sub-Saharan Africa (Granich 2009) where health systems are still fragile and developing.

Assessment of the progress of existing strategies and the development of new strategies to improve the effectiveness of these drugs is essential to continue to improve the global response to HIV and tuberculosis.

This project developed new models for the analysis of trends in prevalence and incidence of disease in high-prevalence countries. It used these models to assess the effectiveness of existing strategies against HIV and/or tuberculosis in these countries, and to assess progress towards disease control and /or elimination.

We used a repeated retrospective cross-sectional survey design, using data from both male and female respondents to Demographic and Health Surveys (DHS).

We used data from 32 sub-Saharan African countries that was publicly available between 2000 and 2011. Between one and four surveys were conducted in each country over this time period, giving a total of 69 datasets from the 32 countries. The surveys covered a total of 832,932 respondents. No surveys were conducted in any country in 2002, but there were between 3 and 8 surveys available for every other year in the data set. The outcome was self-reported history of having ever had an HIV test, worded as follows:

- I don't want to know the results, but have you ever been tested to see if you have the AIDS virus?

The proportion of survey respondents who indicated that they had ever had an HIV test, was estimated, adjusting for survey sample and clustering effects using the weights and survey structure information provided with the DHS data sets. A spatio-temporal smoother was then applied to the resulting data set to generate an estimated proportion for every country and year.

The estimated values of the proportion of respondents ever tested in 2012 were compared with the threshold coverages of testing assumed in the model of Granich et al. These thresholds in Granich were 50% coverage of testing in 2012, and 90% coverage by 2016. The spatio-temporal model cannot predict data outside of

the input data range, but the estimates for 2012 give an understanding of how well these sub-Saharan countries are progressing towards the conditions required for elimination of HIV.

Records were available for a total of 1,040,048 respondents. The number of countries contributing data in each year ranged from 3 (in 2001) to 8 (in 2010). The largest number of data sets contributed was from Tanzania, which conducted five surveys over the period of the study. For all countries, the proportion of respondents ever tested was very low in 2000, as was the proportion reporting condom use. In the subsequent decade the proportion of respondents ever tested increased in all countries, with annualized percentage changes ranging from 10.1% (Guinea) to 29.2% (Madagascar). Figure 1 shows the trend in proportions of respondents tested for each country, with the overall smoothed trend for all data (not country-specific) in red. All countries in the data set follow a similar upward trend, with evidence of an increasing rate of change in recent years. In 2012, 9 of 32 countries (28%) passed a testing threshold of 50% in 2011, and 22 of 32 countries (69%) had this threshold within the 95% confidence interval of their 2012 estimate. In contrast, the proportion of respondents reporting condom increased slowly over the same period, and in some cases declined. Annualized percentage changes in this outcome ranged from -9.7% (Niger) to 14.1% (Rwanda). Four countries (Burundi, Mali, Niger and Sierra Leone) saw a decline in reported condom use over the decade, but there were no countries where the proportion of people ever tested declined. Trends in this outcome are more varied, with some countries showing a slow linear increase in reported condom use, and some showing a decline. For most countries, there is little increase over the time period. Some countries with only a single data point near the centre of the time period show unstable behavior as an artifact of the modeling process, and trends for these countries are probably not reliable.

This analysis found a rapid and sustained increase in the proportion of respondents who reported ever having been tested for HIV over this time period, but no significant improvement in proportions of respondents who reported using condoms at their last sexual encounter. The outcome, ever having been tested for HIV, is a weaker condition for targeting HIV than that assumed for most test-and-treat strategies (which assume high *annual* testing rates) but provides an indication of progress towards the necessary coverage of testing required to sustain a test-and-treat strategy for HIV elimination. Given this caveat, this study found that two thirds of sub-Saharan African countries are on track to reach the testing coverage required for HIV elimination, and these rapid recent increases in testing coverage suggest that countries are scaling up their efforts to achieve the necessary coverage rate within this decade. However, one third of countries are scaling up testing rates too slowly to achieve HIV control or elimination, and new strategies and interventions are required to prevent the continued growth of HIV in these countries.

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2. Gler MT, Skripconoka V, Sanchez-Garavito E, Xiao H, Cabrera-Rivero JL, et al. (2012) Delamanid for multidrug-resistant pulmonary tuberculosis. N Engl J Med 366: 2151-2160
3. Li J, Gilmour S, Zhang H, Koyanagi A, Shibuya K. The epidemiological impact and cost-effectiveness of HIV testing, antiretroviral treatment and harm reduction programs. AIDS 2012; 26(16): 2069 – 2078.
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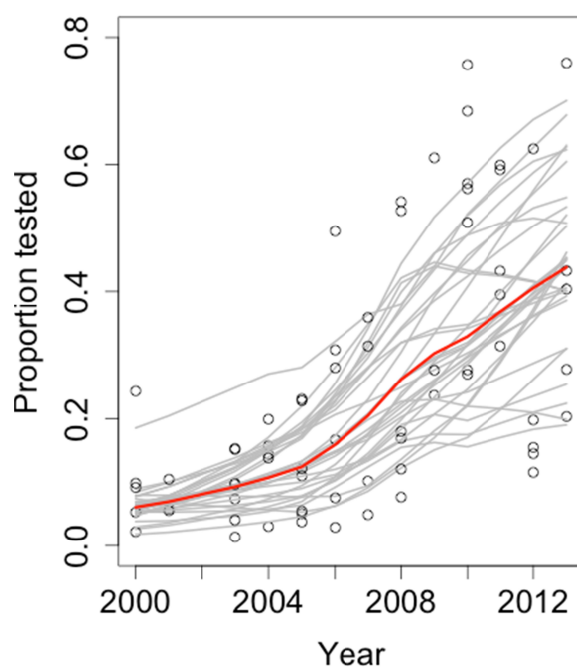
Figure 1   Proportion of respondents reporting ever being tested, 2000-2012, sub-Saharan Africa

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