PSI Health Impact Estimation Model: Prevention of HIV, HBV, and HCV Transmission in Injection Drug Users

Hongmei Yang
Research & Metrics,
Population Services International

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PSI shares its models with all interested individuals or organizations. Please note that the models are updated periodically based on the latest available epidemiological, demographic, intervention effectiveness, and utilization data. As a result, numbers used in this document should be considered illustrative only. They show how the model works, but they are likely to have changed since the time of writing.

For more information or the latest model updates, contact Hongmei Yang at hyang@psi.org.

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Introduction

Development of the DALY Model for Estimating the Health Impact of PSI Products and Services

International public health nongovernmental organizations (NGOs) and other implementers and practitioners of health policy in developing countries find themselves at a crossroads. The issue of monitoring and evaluation has grown beyond its traditional role as an internal management tool and has become a tool for accountability for agencies charged with responsibility for funding and monitoring health interventions. This change occurred partly because new, large-scale funders such as the Global Fund and the Gates Foundation themselves need more effective measures to be accountable for the use of their resources. Additionally, many organizations were drawn together by their focus on the Millennium Development Goals (MDG).

Along with these changes, there has been movement toward a consensus regarding the method of measuring health impact across developing countries. The aim of this effort is to create a more objective component to use in prioritizing program activities and allocating resources. The disability-adjusted life year (DALY) is the result of this effort. The primary purpose of the DALY is to act as an umbrella measure to compare both the true burden of different diseases across different regions of the developing world, and to better estimate the cost-effectiveness of various interventions aimed at reducing that burden. The first phase of the DALY creation process was undertaken by the Disease Control Priorities Project (DCPP), which developed a series of documents designed to both estimate and explain the full burden of various diseases around the world (www.dcp2.org).

The second phase of the DALY creation process involved estimation of the cost-effectiveness of the interventions available to address the diseases. This phase has been more difficult to accomplish because of the conceptual distance between the people charged with evaluating health interventions and the people charged with implementing them. The number of studies estimating the relative cost-effectiveness of public health and clinical interventions in developing countries that incorporate measurement of health outputs using DALYS has increased substantially since the first DCPP report in 2000. However, publication of well-designed field trials is only half the story.

The belief that cost-effectiveness of public health interventions can be influenced by the methods and mechanisms employed, as well as scale, is a large part of the reasoning behind this work. The overall intent is to develop models that will better enable programmers to estimate the cost-effectiveness of public health interventions that are undertaken in practice on a large scale.
PSI DALY Calculator

PSI is developing a series of tools to evaluate the health impact of its interventions and services around the world. The model at the core of this toolkit will estimate: a) the burden of each disease or condition addressed in the countries in which PSI works, and b) the health impact and incremental costs associated with implementation of PSI’s interventions.

The first stage in this process is the development of a functioning (and evolving) mathematical model that estimates the burden of disease and the relative impact of PSI projects in specific countries, for six disease groups or health areas. They are: HIV, family planning, malaria, diarrheal disease, nutrition, and maternal health. The models are currently linear and deterministic, but future intention is to incorporate stochastic data inputs/outputs and non-deterministic relationships between variables. Shown below is a graphical representation of the working components of the model. Each disease area is treated slightly differently because of the nature of the infection or its symptoms, variations in the availability of data, and the complexity of outcomes.
IDU DALY Model for Prevention of HIV, HBV, and HCV Transmission

Background

Population Services International (PSI) is a social marketing organization that promotes healthy behaviors in low-income and vulnerable populations. PSI has programs in 65 countries (www.psi.org) and covers a wide range of health areas. PSI uses the disability-adjusted life year (DALY) as the metric for measuring the health impact of interventions in health areas. A DALY model has been developed for each of PSI’s products/services and behavior change communications (BCC) interventions. The DALY model presented here is the Injecting Drug User (IDU) DALY Model for Prevention of HIV, HBV, and HCV Transmission.

The IDU DALY model estimates the impact of needle/syringe distribution programs and behavior change communication interventions regarding the transmission of blood-borne diseases (specifically, HIV, HBV, and HCV) by injecting drug users. (Note: The health impact of sexual transmission of these diseases is not considered here because it is included in another DALY model specifically dealing with the sexual transmission of HIV.)

Section 1: Principles and Structure of the Model

1.1 General Principles of the DALY Model

An injecting drug user (IDU) who is disease free can become infected with a blood-borne disease through a single contaminated injection. Among the diseases presenting the greatest health threat are HIV, HBV, and HCV (Aceijas and Rhodes, 2007; Manhata et al., 2009; Xia et al., 2008).

An IDU may have HIV and viral hepatitis at the same time, but the IDU will die from only one of the diseases. To avoid double counting, the burden of disease (BOD) measured in number of new infections needs to account for all infections by HIV, HBV, and/or HCV, while the BOD measured in number of deaths and DALYs requires only accounting for the major cause of death. Similarly, the health impact of the intervention, which is measured in terms of deaths averted and DALYs averted, only needs to take into account the major cause of death.

The IDU math model is based on Bernoulli probability theory (Gray et al., 2001; Mastro et al., 1994; Satten et al., 1994). For each seronegative IDU, the probability of being infected with HIV, HBV, or HCV through injection during the study period (one year) is modeled as follows:

\[ P = a \times [1 - (1 - p \times \gamma)^c] \]

Where,

- \( a \) refers to the probability of sharing needles/syringes in the past year,
- \( p \) is the probability of encountering an HIV or HBV or HCV-positive IDU in one sharing (which is assumed to be equal to the prevalence of HIV or HBV or HCV among IDUs),
- \( \gamma \) refers to the transmission probability per injection through a contaminated needle/syringe, and
- \( c \) represents the average number of injections shared per IDU per year.
1.2 General Structure of the DALY Model

The DALY model is designed to estimate both the burden of disease (BOD) and the health impact of PSI interventions (i.e., products and behavior change communication). Calculating the BOD tests the reliability of the model by comparing it to the BOD reported by other organizations (e.g., UNAIDS). BOD is measured by the number of new infections, deaths, and disability-adjusted life years (DALYs). The health impact of PSI interventions is measured by the number of new infections averted (NIA), deaths averted, and DALYs averted per unit of product or per intervention.

To measure the burden of disease and the health impact of PSI interventions, the model is designed with two components: baseline (i.e., a scenario where PSI products/interventions are not present) and follow-up (i.e., a scenario where PSI products/interventions are present). The baseline component, which assumes no incremental interventions, provides an estimate of the potential disease burden of needle/syringe sharing that would accrue in a given year from new infections with HIV/HBV/HCV, and DALYs due to hepatitis-related liver problems or HIV/AIDS. The follow-up component estimates the reduction in the risk of infection that results from incorporating the following PSI products and interventions:

- Needle-distribution programs,
- Behavior change communications to reduce needle/syringe sharing as well as initiation of injecting drug use, and
- Population-wide coverage of these products and interventions.

Section 2: Estimating Disease Burden

In the baseline component, the model runs a scenario where each IDU is \( x \) percent likely to engage in injection sharing and has \( y \) shared injections per year. The likelihood of infection with HIV, HBV, and HCV is estimated from the prevalence of each infection among IDUs. The resulting estimates are then multiplied by the size of the IDU population to obtain the number of new infections of HIV, HBV, and HCV during the period of the study (one year). Summing the new infections for each disease yields the total number of new infections, or the burden of disease.
The natural history of HIV infection indicates that a person who contracts the virus will live for 10 years before the disease progresses to AIDS; thereafter, the person dies after two years. Co-infection (simultaneous infection with two or more viruses) with HBV and/or HCV does not affect the progress of HIV infection (Hoffman, 2009; Thio, 2004). Ninety-five percent of acute HBV infections among adults are self-limiting and infected adults recover within six months. Only 5% of acute HBV infections progress to the chronic stage, which typically shows no symptoms. Chronic hepatitis B progresses to cirrhosis at a rate of 2% to 6% per year, with cirrhosis leading to end-stage liver disease, i.e., liver failure and hepatocellular cancer (HCC), at a rate of 5% per year (Elgouhari et al., 2008). As a result, chronic hepatitis B lasts about 18 years before a person dies, while cirrhosis from hepatitis B lasts about 14.5 years before a person dies. Unlike HBV infections, most acute HCV infections (75% to 85%) among adults progress to chronic hepatitis after six months. It takes an estimated 20 years for chronic HCV infection to develop into cirrhosis (Chen and Morgan, 2006). It takes another 18 years (at rates of 1% to 4% per year) for cirrhosis from HCV to progress to end-stage liver disease (Chen et al., 2006). The natural history of HIV, HBV, and HCV infection is illustrated below in Figure 1.

Among persons infected with HCV, co-infection with HIV accelerates the progression of hepatitis C by reducing the duration of chronic hepatitis C from 20 to 10 years and reducing the duration of cirrhosis from 18 to 5 years (Chung, 2006). An HIV/HCV co-infected person is therefore more likely to die from AIDS than liver disease because of the more rapid progression to AIDS. Among adults with HBV infection, co-infection with HIV increases the risk of progression to chronic hepatitis B from 5% to 25% (Hoffman, 2009). However, data on the impact of HIV on hepatitis B progression to cirrhosis are mixed. Some studies show no negative impact of HIV co-infection on hepatitis B progression, while others report rapid progression to cirrhosis in HIV co-infected persons. Possible explanations for the varying results of these studies include: 1) differences in the prevalence of infecting HBV genotypes and mutant HBeAg-defective HBV strains, 2) the degree of immune suppression, and 3) varying prevalence of co-factors associated with liver damage (alcohol, HCV, HDV) in
coHORTS (Puoti et al., 2006). There is also no data supporting an accelerated progression to hepatic cancer in HIV/HBV co-infected persons (Puoti et al., 2006).

The DALY model assumes that the impact of HIV on hepatitis B progression is the same as the impact on hepatitis C progression. However, whether or not HIV co-infection accelerates the progression of hepatitis B, persons co-infected with HBV/HIV are more likely to die from AIDS than liver disease (when they are not on HARRT). As a result, the value of this parameter has little effect on DALY estimates, and can be ignored. Therefore, both HBV/HIV and HCV/HIV co-infected adults either recover or die from AIDS (75% recovery vs. 25% chronic HBV for HBV/HIV co-infection; 20% recovery vs. 80% chronic HCV for HCV/HIV co-infection) after 12 years of living with the diseases (i.e., 10 years with HIV, two years with AIDS, 0.5 years with acute hepatitis B or C, 10 years with chronic hepatitis B or C, and 1.5 years with cirrhosis).

The disease burden measured as the number of deaths from blood-borne diseases is estimated by summing the number of deaths from AIDS and HBV/HCV monoinfections (simple infections). The disease burden measured in DALYs is estimated by summing the burden of HIV/AIDS, HBV, and HCV and subtracting the burden of premature death (i.e., years of life lost (YLL) due to premature death) from liver disease, among HIV and viral hepatitis co-infected persons.

Section 3: Estimating the Impact of Interventions

In the follow-up component, where the PSI products and interventions are present, the DALY model estimates the impact of each intervention on reducing the burden of HIV/AIDS and viral hepatitis among IDUs. Within the model, a time period of one year is assumed for each scenario because PSI sales figures are based on one year of data.

3.1 Needle Distribution Program

The outputs of the model for the Needle Distribution Program (NDP, or needle social marketing) are new infections averted (NIA), deaths averted, and DALYs averted per needle. The NDP affects the following two infection risk factors:

- Proportion of the target population that engages in sharing needles/syringes, and
- Average number of shared injections per IDU per year.

Data on drug use behavior among IDUs in different parts of the world indicate that IDUs inject an average of two to three times per day, and one-third of the injections are shared with other IDUs (Eicher et al., 2000; Harris, 2006; Liu et al., 2007; MOH Vietnam, 2006; Wu et al., 2007). From this information, an assumed prevalence of 300 shared injections per IDU per year can be calculated. Table 1 (below) presents a summary of the process and output data on NDP interventions in developing countries.

The most conservative estimate of the effectiveness of needle distribution programs (NDPs), based on published data, indicates that with 70% IDU coverage and distribution of 300 clean needles/syringes per IDU per year there is a 47% decrease in the percentage of IDUs who share and a 14% decrease in the frequency of syringe-sharing (Wu et al., 2007). The data will be program-specific for the NDP IDU DALY model when available from PSI TRaC surveys, and will include the following:
• Percentage of IDUs who participated in the Needle Distribution Program during the past year,
• Number of clean needles/syringes distributed per IDU per year, and
• Effects of the Needle Distribution Program (e.g., a decrease in percentage of IDUs who share injections and/or a decrease in the frequency of syringe-sharing).
Table 1: Summary of process and output data of NDP interventions in developing or transitional countries

<table>
<thead>
<tr>
<th>Setting</th>
<th>Average number injections per IDU per day</th>
<th>Percent-age sharing needles/syringes</th>
<th>Percent-age of injections shared</th>
<th>Number of IDU reached</th>
<th>Percent-age of IDUs reached</th>
<th>Number of syringes per IDU per year</th>
<th>Percent decrease in syringe sharing in reached IDUs</th>
<th>Percent decrease in frequency of sharing</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odessa, Ukraine</td>
<td>70%</td>
<td>~6,000</td>
<td>25%</td>
<td>10</td>
<td>38%</td>
<td></td>
<td></td>
<td></td>
<td>Vickerman et al., 2006</td>
</tr>
<tr>
<td>Svetlogorsk, Belarus</td>
<td>92%</td>
<td>~500</td>
<td>50%</td>
<td>96</td>
<td>56%</td>
<td></td>
<td></td>
<td></td>
<td>Vickerman &amp; Watts, 2002</td>
</tr>
<tr>
<td>Dhaka, Bangladesh</td>
<td>75%</td>
<td>~4,700</td>
<td>70%</td>
<td>216</td>
<td>76%</td>
<td></td>
<td></td>
<td></td>
<td>Foss et al., 2006</td>
</tr>
<tr>
<td>Dagou, Guangdong</td>
<td>2.23 (or 814 per IDU per year)</td>
<td>62.8%</td>
<td>&gt;10% in 65.6% sharing IDUs</td>
<td>~140</td>
<td>70%</td>
<td>336</td>
<td>47%</td>
<td>14%</td>
<td>Wu et al., 2007</td>
</tr>
<tr>
<td>Luzhai, Guangxi</td>
<td>2 (or 730 per IDU per year)</td>
<td>74%</td>
<td>&gt;10% in 64.3% sharing IDUs</td>
<td>~400</td>
<td>47%</td>
<td>143</td>
<td>48%</td>
<td>5% (not sig.)</td>
<td>Wu et al., 2007</td>
</tr>
<tr>
<td>VIDUS Study (unpublished data)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>60%</td>
<td></td>
<td></td>
<td></td>
<td>Raboud et al., 2003</td>
</tr>
<tr>
<td>Guangxi, China</td>
<td>2.5 (or 912 per IDU per year)</td>
<td>44%</td>
<td>35%</td>
<td>7%</td>
<td>66%</td>
<td>26%</td>
<td></td>
<td></td>
<td>Liu et al., 2007</td>
</tr>
<tr>
<td>Sichuan, China</td>
<td>2.6 (or 949 per IDU per year)</td>
<td>32.7%</td>
<td>17%</td>
<td>7%</td>
<td>55%</td>
<td>16%</td>
<td></td>
<td></td>
<td>Liu et al., 2007</td>
</tr>
</tbody>
</table>
3.2 BCC to Reduce Needle/Syringe Sharing

The outputs of the model for behavior change communication (BCC) to reduce needle/syringe sharing are new infections averted (NIA), deaths averted, and DALYs averted per intervention. BCC to reduce needle/syringe sharing affects the following two infection risk factors:

- Proportion of the target population that engages in sharing needles/syringes, and
- Average number of shared injections per IDU per year.

Unlike the NDP model, all the behavioral data for the BCC model come from PSI TRaC surveys. For BCC programs, two rounds of TRaC surveys (i.e., pre- and post-intervention surveys) are suggested for monitoring and evaluation. Unless significant changes in behavior (due to PSI interventions) are observed between the two rounds, new infections averted (NIA) and DALYs averted are not estimated as part of the model. When two rounds of data are not available, one round with sound statistical analysis showing program impact may be acceptable for the BCC model. The Inter-department Metrics Working Group (IMWG) is discussing the possibility of using one round of TRaC data for evaluation analysis and will come up with a guideline.

3.3 BCC to Reduce Initiation of Injection

The outputs of the model for behavior change communication (BCC) to reduce initiation of injection are new infections averted (NIA), deaths averted, and DALYs averted per intervention. Because most injecting drug users were introduced to the practice by other IDUs, the PSI program targets IDUs instead of non-injecting drug users. IDUs are taught not to help non-injectors to initiate drug injection.

Using the proportion of new IDUs (i.e., initiated injection within the past year) who were helped at initiation by another IDU (“A”) and the number of non-injectors a current IDU helped to inject for the first time in the past year (“B”), the number of initiators can be estimated as the total estimated number of IDUs * B * (1/A). BCC to reduce initiation of injection is assumed to have an impact on the following two infection risk factors:

- Average number of non-injectors per year that an IDU helped to initiate injection, and
- Percentage of IDUs who initiated injection with the help of an IDU.

Similar to the “BCC to reduce needle/syringe sharing” model, behavioral data for the “BCC to reduce initiation of injection” model come from PSI TRaC surveys (i.e., pre- and post-intervention surveys). For BCC programs, two rounds of TRaC survey data are suggested for monitoring and evaluation. Unless significant changes in behavior (due to PSI interventions) are observed between the two rounds, new infections averted (NIA) and DALYs averted are not estimated as part of the model. When two rounds of data are not available, one round with sound statistical analysis showing program impact may be acceptable for the BCC model, on the decision of the IMWG.
References


DCPP: Global Burden of Disease and Risk Factors.


Gray R & Hoffman L. PSI Central Asia: Needle/Syringe DALY Averted Calculator.


Hoffman C. Hepatitis B. Available at John Hopkins POC-IT Center Point-of-Care Information Technology (http://www.hopkinsaids.edu/diagnosis/opportunistic_infections/viral/hepatitis_b.html?contentInstanceId=87692009); last visit on Jun 4, 2010.


PSI SMRs: Central Asia: The knowledge, attitudes and practices of IDUs relating to sharing needles/ syringes and consistency of condom use in Tashkent and Bishkek 2007.


### Appendix A: Parameters and Sources

#### Table A.1 Epidemiological information

<table>
<thead>
<tr>
<th>Country (region)</th>
<th>Prevalence among IDUs</th>
<th>Percentage of IDUs who share</th>
<th>Number of IDUs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HIV (%)</td>
<td>HBV (%)</td>
<td>HCV (%)</td>
</tr>
<tr>
<td>China (Guangxi)</td>
<td>64% a</td>
<td>43% (51%8, 36%21)</td>
<td>90% (90%+ 5)</td>
</tr>
<tr>
<td>India</td>
<td>45% c</td>
<td>21% (18%9, 40%13, 4%14)</td>
<td>90% (90%+ 5)</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>3% b</td>
<td>1.5%</td>
<td>60% w</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>14.3% l</td>
<td>???</td>
<td>54.2% l</td>
</tr>
<tr>
<td>Mexico</td>
<td>6% t</td>
<td>74% (61%19, 88%23)</td>
<td>90% (90%+ 5)</td>
</tr>
<tr>
<td>Myanmar</td>
<td>40% b</td>
<td>???</td>
<td>???</td>
</tr>
<tr>
<td>Russia</td>
<td>11.8% d</td>
<td>38% 29</td>
<td>70% (50-90%5)</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>17.3% v</td>
<td>12%</td>
<td>32.6% v</td>
</tr>
<tr>
<td>Thailand</td>
<td>40% a,b,c</td>
<td>80% (77%24, 88%25, 75-80%27)</td>
<td>90% (90%+ 5)</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>30% b</td>
<td>???</td>
<td>???</td>
</tr>
<tr>
<td>Vietnam</td>
<td>18.4% j</td>
<td>16.4% y</td>
<td>70% (50-90%5)</td>
</tr>
</tbody>
</table>

Note: orange numbers related to HBV and HBV/HIV co-infection are obtained by assuming (HBV & HIV co-infection)/ HBV = 40% based on data from China, India, Thailand and Vietnam. Orange numbers related to HCV and HCV/HIV co-infection for Mexico, Russia, Tajikistan are obtained by assuming (HCV & HIV co-infection)/HIV = 2/3 based on data from Kazakhstan and Kyrgyzstan.

c: Aceijas et al., 2004
d: UNGASS Country Progress Report (Russia 2008)
e: UNGASS Country Progress Report (China 2008)
f: PSI SMRs- China 2006
g: Liu et al., 2007
h: Eicher et al., 2000
i: Country Sentinel Surveillance 2007 (email from Leila Koushenova dated on 08/04/08)
k: Gore-Felton et al., 2003
m: Wattana et al., 2007
n: Thao et al., 2006
o: MOH, Vietnam 2006
p: PSI SMRs- Central Asia 2007
q: PSI SMRs- Russia 2006
r: PSI SMRs- Vietnam 2006
s: Lam NT 2008
t: Ministry of Health - National Epidemiology Bureau. Data at December 31 2007
y: Vietnam_Review_of_current_data
z : pls refer to j. also email to Duong Le Quyen on Aug26, 2010
5. Aceijas C & Rhodes T 2007
8. Baozhang et al 1997
10. Garten et al., 2005
11. Ruan et al., 2004
14. Mahanta et al., 2009
19. Samuel et al., 2001
20. Bao et al., 2009
22. Li et al., 2007
23. Baumbach et al., 2008
24. Taketa et al., 2003
25. Sunthornchart et al., 2008
27. Sugunuma et al., 1998
29. Krupitsky et al., 2006
30. Rhodes et al., 2005
Biological information
Transmission probability per sharing of contaminated needle/equipment:
HIV: 0.0097 (Hudgens et al., 2002; Vickerman and Watts, 2002)
HBV: 0.3 (Simons et al., 1999)
HCV: 0.011 (0.4%-1.8%, http://www.healthsystem.virginia.edu/internet/epinet/estimates.cfm)

Disease-related information
Duration of HIV: 10 years
Duration of AIDS: 2 years
Natural history of HBV infection (Elgouhari et al., 2008): see Figure 1
Natural history of HCV infection (Chen and Morgan, 2006): see Figure 1
Progression of hepatitis B when co-infected with HIV: 25% of acute HBV infections progress to chronic HBV infection (Hoffman, 2009); duration of chronic HBV infection reduces to 10 years and duration of cirrhosis reduces to 5 years (see page 3 for details).
Progression of hepatitis C when co-infected with HIV: 5%-20% (choose 10%) of acute HCV infections clear viruses in a year (Swan et al., 2008); duration of chronic HCV infection reduces to 10 years and duration of cirrhosis reduces to 5 years (Chung, 2006; Swan et al., 2008).
Disability weight of HIV infection: 0.135 (DCPP)
Disability weight of AIDS: 0.505 (DCPP)
Disability weight of acute hepatitis B or C: 0.211 (DCPP)
Disability weight of cirrhosis: 0.330 (DCPP)
Age of infection: 24 years old
Life expectancy: 81.25 years-12= 69.25 years
[Note on life expectancy: IDUs differ from non-IDUs in terms of life expectancy because of their drug abuse behaviors. According to Michael Kazatchkine (Executive Director of the Global Fund to Fight AIDS, Tuberculosis and Malaria), IDUs live 12 years less than non-IDUs who become infected with HIV in their 20s and have access to antiretroviral drugs for the rest of their life (http://ipsnews.net/news.asp?idnews=46632). Therefore, 12 years was subtracted from the 81.25 years life expectancy of IDUs.]

Behavioral data in NDP submodel
Average number of shared injections per IDU per year: 300 (Harris, 2006; Eicher et al., 2000; MOH Vietnam, 2006)
Percentage of IDUs who share needles/equipments: country-specific (See Table 2)

Efficacy of products/interventions
NDP reduces proportion of sharing by 47.6% (Wu et al., 2007) and reduces frequency of sharing injections by 14% (Wu et al., 2007)

NDP program-related data
Percentage of IDUs who attend NDP programs: 70% (Wu et al., 2007)
Number of clean needles distributed per IDU per year: 300 (Wu et al., 2007)
### Table A.2 DALY coefficients for needle/syringe distribution program

<table>
<thead>
<tr>
<th>Country</th>
<th>HIV prev IDU</th>
<th>HBV prev IDU</th>
<th>HCV prev IDU</th>
<th>HIV/HBV co-infection IDU</th>
<th>HIV/HCV co-infection IDU</th>
<th>% IDUs who share</th>
<th>Infection averted</th>
<th>Deaths averted</th>
<th>DALYs averted</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>64%</td>
<td>43%</td>
<td>90%</td>
<td>14%</td>
<td>15%</td>
<td>40%</td>
<td>0.00020</td>
<td>0.00002</td>
<td>0.000348</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00036</td>
<td>0.00004</td>
<td>0.00014</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00006</td>
<td></td>
<td>0.00020</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00063</td>
<td></td>
<td>0.000382</td>
</tr>
<tr>
<td>India</td>
<td>45%</td>
<td>21%</td>
<td>90%</td>
<td>15%</td>
<td>16%</td>
<td>87%</td>
<td>0.0006</td>
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<td>HCV 7.9%</td>
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<td>HIV only + HBV + HCV Total</td>
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<td>38%</td>
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Consider HIV only + HBV infection + HCV infection

Total

0.00018 0.00039 0.00018 0.00076
0.00022 0.00052 0.00029 0.00102

0.00022 0.00022 0.00020 0.00044
0.00028 ? ? 0.00028

0.00014 0.00031 0.00010 0.00055
0.00028 ? ? 0.00028

0.000312 0.00015 0.00063 0.00390
0.00366 0.00020 0.00095 0.00482

0.00235 0.00012 0.00033 0.00279
0.00484 0.00048 0.00048 0.00484