Report on WHO/UNAIDS Meeting on
Forecasting ARV needs up to 2010
7-8 November 2005, Geneva

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Acknowledgments

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Executive Summary

In the context of global initiatives towards the goal of universal access of AIDS patients to healthcare, including antiretroviral (ARV) treatment, an increased and secured production of ARV medicines from 2005 to 2010 will be required to meet the increase in demand for treatment in low and middle income countries. The demand scenario, as presented by the UNAIDS Secretariat in the paper on resource needs for HIV/AIDS up to 2010 at the last Programme Coordinating Board in June 2005, predicts that there will be 9.8 million people on ARV therapy (ART) in developing countries in 2010.

In recent discussions between WHO and representatives from innovator and generic pharmaceutical companies on ARV production capacity, the necessity to forecast ARV market trends has emerged as one of the major elements to inform decisions regarding possible expansion of present ARV production capacity. The need for a forecasting exercise applies to Active Principal Ingredients (APIs) and finished ARV medicines.

To respond to these urgent needs, a meeting organized by WHO and UNAIDS was held in Geneva on 7-8 November 2005, bringing together experts involved in the planning of AIDS treatment programme and manufacturing industry observers, to discuss the elements and produce forecasts of the ARV market in low and middle income countries up to 2010. Over the course of the two days, existing ARV consumption data and forecasting models were presented and discussed, and participants offered their views on the importance of various factors that need to be taken into account in the development of improved forecasting models.

Baseline consumption figures were presented from several sources, including data from ARV procurement in 40 countries in the Global Price Reporting Mechanism (GPRM) set up by WHO's AIDS Medicines and Diagnostics Service (AMDS), from the Brazilian Ministry of Health national report on ARV consumption, from ART use in selected PEPFAR countries, and from ARV procurement in 25 countries monitored by the Clinton Foundation HIV/AIDS Initiative (CHAI). Analysis of the different data showed similar consumption patterns, including percentages of patients on 1st line therapies and the relative proportions of different ARVs in most recent ARV programmes. However, the consumption in older - mostly Latin American - treatment programmes, differed from those countries, both in the type of first line treatment used, and in the relatively greater market share of second line treatments.

Two models predicting the future size of the ARV market were presented, one from UNAIDS and one from CHAI. The UNAIDS model makes two sets of predictions of future needs, based on the prevalence of HIV, the proportion of HIV-infected people needing ART, and the rate of scale up. HIV epidemics are classified into one of three categories (low-level, concentrated and generalized), and prevalence predictions are based on these classifications, using low and high scenario assumptions. The CHAI scenario starts with actual treatment numbers, rather than prevalence figures, and uses three separate forecast scenarios based on different assumptions.
According to the UNAIDS model, the low and high case scenarios predict approximately 5 million and 10 million people, respectively, receiving ARVs in low and medium income countries in 2010. The CHAI model predicts that ART access in developing countries could grow from one million in 2005 to a low of 2.3 million and a high of 5.2 million by 2008.

The meeting concluded with a better understanding of the factors that affect antiretroviral usage and scale up rates, and the participants reached a consensus on the next steps to arrive at a harmonized model for forecasting antiretroviral demand. The two major outcomes of the meeting included:

1) The establishment of a working group including WHO, UNAIDS (which contributes, in addition to its own expertise, that of the Mexico National Institute of Public Health (INSP)), UNICEF, the Partnership for Supply Chain Management, CHAI, Management Sciences for Health (MSH) and John Snow International (JSI). This working group was charged with the task of developing a model for demand forecasting that takes into account - to the extent possible - the technical recommendations made at the consultation, and using this model to forecast ARV needs. The group expected to have the new forecasts prepared by the end of January 2006.

2) The production of a tentative forecast of ARV needs up to 2010 in low and middle income countries developed by AMDS based on the analysis of current ARV consumption in low and middle income countries, expert opinion of future treatment trends and using the UNAIDS scenario of uptake of ARV therapy in resource-limited settings.
Introduction

In the developed world, AIDS, once a certain death sentence, is now perceived to be a manageable disease through the introduction of a range of antiretroviral medicines, allowing people with AIDS to lead relatively normal lives. In many low and middle income countries, however, AIDS remains a deadly disease of catastrophic proportions, because ART is not sufficiently available. The inability of so many AIDS patients to receive treatment when effective medications exist is an injustice against which UNAIDS and WHO therefore called for urgent action, with the "3 by 5 Initiative" in September 2003. Partly thanks to the momentum generated by "3 by 5", the goal of universal access of AIDS patients to effective treatment by 2010 was endorsed at the most recent G8 summit in Gleneagles. This demonstration of political will is a much welcome development in the fight against AIDS.

One of the prerequisites to achieving this goal of universal scale up of access to HIV treatment is that sufficient quantities of each ARV must be produced to meet needs. At least twelve different drugs need to be available for the effective long-term treatment of AIDS, and they are produced by many originator and generic pharmaceutical companies. Securing the production and supply of these drugs in sufficient quantities in the future requires as much as a few years advance planning. This planning should assure the availability of raw materials and chemical intermediates, the availability of the necessary production equipment (which often requires considerable investments), the time needed to produce the drugs in multi-step processes, the need to develop specific labelling and registration, and logistics planning to ensure that the drugs are properly shipped and delivered where needed. For all these reasons, global forecasting is a critical part of the planning exercise. Insufficient forecasting for a drug today can lead to its shortage in a few years. On the other hand, excessive forecasts of drugs can lead to a misallocation of resources, wastage, and a lack of confidence in the entire forecasting system, with potentially serious consequences.

The other important rationale for preparing accurate forecasts is to have a solid basis for advocacy purposes in order to secure the necessary funding to ensure access to ARVs for all those in need. For this purpose, some of the details of percentage usage of individual ARVs may be of lesser importance than the number of patients expected to be treated in individual countries, and forecasts of needs (as opposed to forecasts of demand) play a greater role than for the purpose of supply planning.

In light of the above, WHO and UNAIDS organized a meeting in Geneva on 7-8 November 2005, bringing together international experts involved in the planning of AIDS treatment programmes, with the presence of observers from pharmaceutical companies producing ARVs, with the goal of developing an accurate forecast of future demand for ARVs that can be provided to the industry. The forecasting exercise can be broken down into two aspects: the prediction of scale up rate, which is the rate of increase of the percentage of people needing ARV treatment that are actually treated (coverage); and the prediction of the percentage represented by each individual ARV. The models used to make these predictions are based on a large number of assumptions and on specific methodologies. The meeting was a means of
discussing these factors among experts, with the goal of reaching a unique forecasting model with the highest reliability possible, based on current knowledge, experience and expectations.

Meeting structure and expected outcome

In her opening remarks, Teguest Guerma, Deputy Director of WHO's HIV Department, emphasized the need to communicate without ambiguity about the challenge of making sufficient product available to meet treatment demands, as supplies of several antiretroviral drugs have already been running low. Peter Ghys, Acting Associate Director of UNAIDS and Joseph Perriëns, Director of WHO's AIDS Medicines and Diagnostics Service (AMDS), also emphasized at the start of the meeting the fact that forecasting involves dealing with uncertainty, and it is impossible to achieve a perfectly accurate forecast. Nonetheless, it was essential to hold discussions now on how to improve the forecasts to ensure that supplies of ARVs and Active Pharmaceutical Ingredients do not run out in the future. The objectives set out were to understand the trends in the use of ARVs in low and middle income countries until 2010, and to forecast the actual ARV needs and demands. The meeting represented an important step in the process of refining assumptions, and preparing a harmonized forecasting model. The intended outcome was an improved consensus on the weight of different assumptions, and the agreement on specific next steps and milestones in order to reach an accurate forecasting model within a given timeframe.

The objective for the first day of the meeting (see agenda in Appendix) was to understand and review existing models and clarify what the essential data are in order to determine the future ARV market. It included an overview of the objectives and methodology, a presentation of two existing scenarios for estimating ARV coverage from UNAIDS and CHAI, a review of baseline consumption of ARVs in low and middle income countries, the presentation of the results of a previously conducted survey of experts on ARV consumption trends, the presentation of preliminary forecasts up to 2010 based on the UNAIDS scenario and the survey results, and various discussions.

The objective for the second day was to improve future forecasts. A second round of the expert survey was conducted, with the experts applying assumptions discussed on the first day, and the results were presented later on during the day after compilation of the data. In between, an open brainstorming session was held in order to collect opinions and suggestions on how to improve forecasts. The meeting concluded with specific next steps and milestones.

Existing forecasting models

Two forecasting models predicting the number of people receiving treatment between 2005 and 2010 in low and middle income countries, one from UNAIDS and one from CHAI, were presented.
A. UNAIDS

The UNAIDS scenarios are built on assumptions about the prevalence of HIV, the number needing ARV therapy (ART), and the rate of scale up. HIV epidemics are classified into one of three categories (low-level, concentrated and generalized), and prevalence predictions are based on these classifications. For generalized epidemics, the HIV prevalence trends are extrapolated from HIV prevalence trends in ANC surveillance, and the assumption is that incidence will remain stable in the future. For concentrated and low-level epidemics, the prevalence projections use the estimated size of groups at risk, the estimated current prevalence based on most recent surveillance data, and projections based on assumptions of HIV prevalence saturations in high-risk groups.

The number of people newly needing ART each year is assumed to be the number of people who would die within 2 years without ART (a proxy for the WHO guideline of CD4 count below 200), and depends on the incidence of HIV some years previously (corresponding to the time of infection). For 2006-2010, this is mostly determined by HIV incidence that has already taken place. The total number of people needing ART is the sum of the number of people newly needing it and the number of survivors from the previous year. This total number accumulates in future years and remains dependent on the number having received treatment in previous years.

Finally, low and high scenario assumptions are applied. For the low scenario, baseline coverage is calculated for each country from the most recent “3 by 5” report and represents the percentage of those in need who actually received ART. Coverage is then assumed to increase in a linear way in each country, to reach a level of 60% in 2012. This implies that scale up is faster in countries with a lower baseline starting point. The high scenario operates differently, with the baseline being the unmet need according to the most recent “3 by 5” report. Here, the percentage of unmet need is assumed to decrease in a linear way in every country until coverage reaches 85%. This assumption is based on observed rates of decrease of the most urgent unmet need (1 year from death) in previous years, by country. The implication is a non-linear increase in coverage, with the scale up assuming a steadily increasing coverage for new cases. The low and high scenario predict approximately 5 million and 10 million people, respectively, to be receiving ARVs in low and medium income countries in 2010.

In response to a question, Robert Greener, Economics Adviser at UNAIDS, who presented the UNAIDS forecasting model, emphasized that it is a normative forecast, and is based on the assumption that coverage will continue to increase in all countries, including those with very low current levels of access to health services. He expressed the belief that the assumptions underlying the model are both realistic and achievable.

B. Clinton Foundation HIV/AIDS Initiative (CHAI)

The CHAI models use as the baseline the actual treatment numbers, in most cases updated as of June 2005, directly from countries, and/or from WHO. Demand estimates are based on national protocols, and the protocol and patient distribution are actual data for all consortium and high-volume non-consortium countries, which
together represent 85% of the total global volume. For the remaining countries, generalized regional profiles were compiled based on WHO guidelines. Country data (current treatment numbers, targets and protocols) come from CHAI country teams and regional managers, working closely with ministries of health.

Three separate forecast scenarios are used. The low scenario assumes that current monthly patient accrual data is projected going forward, assuming there is no additional growth in the rate of accrual. The medium scenario assumes that each country achieves a percentage of their self-defined target. This percentage is adjustable, with the default set to 80%. In a small number of non-consortium countries, where country targets were unavailable, a percentage of ART need is assumed instead. The high scenario assumes that each country achieves a percentage coverage of their national ART need. This percentage is again adjustable, with the default set to 80%. The scenarios make explicit assumptions about treatment failure results, as well as about the percentage of paediatric patients.

The CHAI forecasts predict that ART access in developing countries could grow from one million in 2005 to a low of 2.3 million and a high of 5.2 million by 2008, with a 56% variance between the three scenarios. The observation was made that 80% of the volume is driven by 11 countries, an important consideration for focusing attention on the data that will have the greatest impact on overall forecasts. The uptake of 2nd line ARV formulations is expected to vary considerably from one region to another, affecting the demand for specific ARVs. Finally, CHAI’s medium scenario was shown to fall between UNAIDS’ high and low scenarios, demonstrating a level of consistency between the two models.

Anil Soni of the Clinton Foundation, who presented the CHAI forecasting model, stressed both the usefulness and effectiveness of working with suppliers to make the markets work more efficiently and maintain supply to meet demand. He stated that CHAI has been quite successful in anticipating volume in the past two years, with the exception of two drugs. He affirmed that there is a need for continued and improved forecasts, especially in light of the increasing cost pressures on suppliers, who have been asking for more specific information such as individual market forecasts as well as requirements for both APIs and formulations. He expressed the need to create a single best forecasting model, rather than having several models coexist.

In response to a question, Anil Soni pointed out the need to take into account price elasticity as one of the major factors affecting demand, since even if need predictions are correct, the large price differences between different formulations affect prescribing patterns.
Baseline consumption data

Several sets of baseline consumption data were presented: WHO AMDS presented two data sets: one on 2005 ARV procurement in 40 countries in the Global Price Reporting Mechanism (GPRM) and one from the Brazilian Ministry of Health national report; MSH/RPM Plus presented data on ART use in selected countries supported by PEPFAR, and CHAI presented data derived from ARV procurement in 25 countries.

A. WHO AMDS baseline consumption data

The GPRM contains data on ARV procurement through or by organizations that collaborate with WHO AMDS, with the main information sources being the Global Fund against AIDS, Tuberculosis and Malaria, the International Dispensary Association, and, UNICEF’s Supply Division, with additional contributions from the Central Procurement Service of WHO, Management Services for Health, and the WHO 3by5 country officers. The analysis done was based on volumes of ARV ordered between 1 January and 31 July 2005, using data included in the GPRM database up to 15 August 2005. The Brazilian Ministry of Health 2004 report on ARV covers consumption in the national ARV treatment programme from 1 January to 31 December 2004.

The WHO AMDS procurement data were divided into three groups: low income countries, middle income countries and Brazil (See Box 1). The decision to present the data in this way followed an exploratory data analysis showing a dramatically different pattern of drug transactions in Brazil compared to the other markets. The procurement data were converted into numbers of patients by converting the number of smallest pharmaceutical units procured into the number of patient-years of drugs used, and the percentage of individual drugs used was expressed against the total volume of API procured in patient-years. Drugs were deemed to be used in 1st line and 2nd line treatments when recommended as such for the majority of patients according to the 2003 WHO ART guidelines. Specifically, the sales of the five ARVs recommended by WHO for 1st line treatment (stavudine, zidovudine,
lamivudine, nevirapine and efavirenz) were taken to represent the total volume of 1st line treatments used, and all others were taken to represent 2nd line treatments.

Box 1: Classification of the 42 countries listed in the Global Price Reporting mechanism into Low Income Country, Low Middle Income Country and Upper Middle Income Country by using the World Bank Index.

<table>
<thead>
<tr>
<th>Country classification (WB index)</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low income countries, total = 27</td>
<td>Benin, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Congo, Côte d’Ivoire, Democratic Republic of Timor-Leste, Eritrea, Ethiopia, Guinea, Haiti, India, Kenya, Lesotho, Liberia, Malawi, Mauritania, Mozambique, Myanmar, Nicaragua, Niger, Nigeria, Republic of Moldova, Sudan, Zambia</td>
</tr>
<tr>
<td>LMI countries, total = 11</td>
<td>Guatemala, El Salvador, Fiji, Georgia, Honduras, Jordan, Kazakhstan, Swaziland, Thailand, Ukraine.</td>
</tr>
<tr>
<td>UMI countries, total= 03</td>
<td>Estonia, Gabon, South Africa</td>
</tr>
</tbody>
</table>

Source: AIDS Medicines and Diagnostics Service, WHO, November 2005

Some of the main conclusions drawn were:

- The data used for the analysis include the equivalent of 290 000 patient-years and represent about 30% of the total ARV market in developing countries.
- 1st line drugs represented 96.3% and 96.8% of total drugs transacted in low and middle income countries, respectively. In Brazil, the proportion of 1st line drugs was significantly lower, at 74.5% of the volume, with drugs considered 2nd line comprising 22% of the volume.
- The distribution of commonly used ARVs was very similar in low and middle income countries but significantly different in Brazil. Specific figures are listed in Table 1.
  - The most common 1st line ARVs used in low and middle income countries were stavudine (25% and 27% of all volume expressed in patent years, respectively), lamivudine (31% and 30% of all volume expressed in patent years, respectively) and nevirapine (28% and 26% of all volume expressed in patent years, respectively).
  - Most of the stavudine, lamivudine and nevirapine were transacted as a fixed dose combination of those drugs in both LI and MI countries (45% and 52% of 1st line ARV formulations).
  - Zidovudine and efavirenz - the other ARVs recommended by WHO for 1st line treatment - were less often used in LI and MI countries, with a market share of triple therapies for zidovudine of 5% and 5% of all volume expressed in patent years, respectively, and 7% and 8% of all volume expressed in patent years, respectively, for efavirenz.
  - In low income countries, the most commonly used 2nd line ARVs (expressed as % of volume, expressed in patient-years) were tenofovir (TDF) (1%), indinavir (0.5%), emtricitabine (0.4%), didanosine (ddI) (0.3%), lopinavir (0.3%), nelfinavir (0.2%) and abacavir (ABC) (0.2%). In middle income countries, 2nd line ARVs used were didanosine (0.9%), indinavir (0.8%), nelfinavir (0.3%) and abacavir (0.2%).
  - In Brazil, the most commonly used 1st line ARVs (expressed as % of volume, expressed in patient-years) were lamivudine (28%), zidovudine
22% and efavirenz (12%). As mentioned above, compared to the volumes reported through the GPRM from low and middle income countries, there were significant differences: in Brazil, the volume of stavudine was significantly less than that of zidovudine, and the volume of nevirapine less than that of efavirenz [both p<10^-6]. The most commonly used 2nd line ARVs (expressed as % of volume, expressed in patient-years), were didanosine (ddI) (5%), lopinavir (4%), nelfinavir (4%), indinavir (2%), tenofovir (TDF) (0.8%).

- In the GPRM, only 22% of the ARV volume came from the originator companies, compared with an overall figure of about 50% for resource-limited countries calculated from originator company reports. This indicates that the sample is biased in favor of generic suppliers. It is not clear whether this introduces a significant bias in the estimate of the relative importance of the different molecules/compounds used.

It was noted that the WHO ART guidelines are likely to change in 2006, with the addition of TDF and ABC to the proposed 1st line regimen.

<table>
<thead>
<tr>
<th></th>
<th>LOW INCOME COUNTRIES</th>
<th>MIDDLE INCOME COUNTRIES</th>
<th>BRAZIL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of total volume of patients/years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>stavudine (d4T)</td>
<td>25%</td>
<td>27%</td>
<td>8%</td>
</tr>
<tr>
<td>zidovudine (ZDV)</td>
<td>5%</td>
<td>5%</td>
<td>22%</td>
</tr>
<tr>
<td>lamivudine (3TC)</td>
<td>31%</td>
<td>30%</td>
<td>28%</td>
</tr>
<tr>
<td>nevirapine (NVP)</td>
<td>28%</td>
<td>26%</td>
<td>4%</td>
</tr>
<tr>
<td>efavirenz (EFV)</td>
<td>7%</td>
<td>8%</td>
<td>12%</td>
</tr>
<tr>
<td>abacavir (ABC)</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.5%</td>
</tr>
<tr>
<td>didanosine (DDI)</td>
<td>0.3%</td>
<td>0.9%</td>
<td>5%</td>
</tr>
<tr>
<td>indinavir (IDV)</td>
<td>0.5%</td>
<td>0.8%</td>
<td>2%</td>
</tr>
<tr>
<td>lopinavir + ritonavir (LPV/r)</td>
<td>0.3%</td>
<td>0.1%</td>
<td>4%</td>
</tr>
<tr>
<td>tenofovir (TDF)</td>
<td>1%</td>
<td>0.0%</td>
<td>0.8%</td>
</tr>
<tr>
<td>emtricitabine (FTC)</td>
<td>0.4%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>nelfinavir (NFV)</td>
<td>0.2%</td>
<td>0.3%</td>
<td>4%</td>
</tr>
<tr>
<td>ritonavir bust (RTV)</td>
<td>0.7%</td>
<td>0.6%</td>
<td>8%</td>
</tr>
<tr>
<td>atazanavir (ATZ)</td>
<td></td>
<td></td>
<td>1%</td>
</tr>
<tr>
<td>saquinavir (SQV)</td>
<td></td>
<td>0.15%</td>
<td>0.5%</td>
</tr>
<tr>
<td>amprenavir (APV)</td>
<td></td>
<td></td>
<td>0.2%</td>
</tr>
<tr>
<td>Total volume of API</td>
<td>321 770</td>
<td>83 450</td>
<td>487 307</td>
</tr>
<tr>
<td>Number of patients years of</td>
<td>106 500</td>
<td>27 800</td>
<td>156 300</td>
</tr>
<tr>
<td>triple therapy (approximation)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Aids Medicines and Diagnostics Service, WHO

B. PEPFAR baseline consumption data

PEPFAR consumption data were presented by MSH/RPM Plus. They came from 7 countries, based on adult populations alone, or adult and paediatric populations. Some of the limitations pointed out were that: data collected from selected countries may not be representative of the total population treated in countries and may include non-PEPFAR supported patients; data were not available on the rate of switching from 1st to 2nd line regimens; all reported regimens were included in analysis of 1st line ARV distribution; all regimens, except for WHO 1st line regimens, were considered in the analysis of 2nd line ARV distribution; ritonavir was excluded in the
analysis; some paediatric regimens may have been counted as adults; and some 
paediatric regimens were not organized by formulation taken because data were not 
available.

Percentage use of individual ARVs was calculated for adult and paediatric patients in 
1st and 2nd line regimes. One of the findings from these data was that 95% of both 
adult and paediatric patients were on WHO 1st line regimens.

<table>
<thead>
<tr>
<th>Percentage of Adult Patients on WHO 1st-line Regimens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
</tr>
</tbody>
</table>

Source: Management Sciences for Health

C. CHAI baseline consumption data

CHAI consumption data were derived from an order tracking database that strives to 
capture similar items to the GPRM from 25 countries, and used to calculate % use of 
individual ARVs. Calculations also revealed the percentage usage of different fixed 
dose combinations.

Key findings included the following:
- Lamivudine, nevirapine and stavudine were the most commonly procured 1st line 
drugs.
- Fixed dose formulation made up 55% of the total volume of formulations 
procured. The fixed dose formulation of d4t+3TC+NVP was ordered with the 
highest frequency (45% of total volume), followed by ZDV+3TC (9% of total 
volume).
- Single pill formulations of the 1st line drugs (ZDV, d4t, 3TC, NVP and EFV) 
made up 39% of total volume.
- Substantial differences were found between the Latin American and African 
maintain 1st line ARV used (zidovudine is much more frequently used 
in Latin America) and in the percentage of uptake represented by 2nd line ARVs 
(substantially higher in Latin America).
- Paediatric order data showed that syrups are procured in higher volume than pills. 
It was estimated that paediatric patients are expected to comprise 10% of total
people on treatment by 2008, with obvious implications for the formulations in demand.

Regionally, the data reveals that the Latin American market may behave differently than the African market.

![Graph showing Stavudine vs. Zidovudine and 2nd Line Uptake (% of total volume)](Source: Clinton Foundation HIV/AIDS Initiative, November 7, 2005)

It was observed that the results from the three studies led to similar conclusions regarding consumption patterns, including percentages of patients on 1st line therapies and the relative proportions of different ARVs.

**Round 1 expert survey and use in forecasting**

**A. Objective and description of round 1 expert survey**

The objective of the expert survey was to obtain feedback from experts on their perceptions of likely trends in ARV use from 2005 to 2010, using ARV consumption results from the GPRM as a starting point, and subsequently to introduce the results of the survey into the existing forecasting model. The experts, who were nominated by national AIDS authorities from individual countries, all had clinical expertise and responsibility in planning ARV treatment programmes. The survey was distributed to 15 experts prior to the meeting, from whom 14 replies were received. The specific queries in the questionnaire addressed the relative importance of specific ARVs in both 1st and 2nd line therapy, as well as the relative importance of dual therapy as a percentage of 1st line therapy, the relative importance of 1st and 2nd line therapies, the rate of switching from 1st to 2nd line and from 2nd line to salvage therapy, and of the relative importance of different types of 1st line therapy (2 NRTI + 1 NNRTI, Triple NRTI, and 2 NRTI + PI). A list of possible assumptions regarding potential factors that might influence ARV regimens and ARV use in the coming years was included for consideration by the survey participants.

The attempt was made to use a modified version of the Delphi method consisting of two rounds of expert survey, but with face-to-face discussions among experts between the two rounds. This approach carried with it an inherent risk that in a face-to-face discussion the results could be biased towards the views of the more vocal participants. The results of the expert survey conducted prior to the meeting were presented at the meeting followed by informative discussions, and a second round was carried out at the meeting in order to try to improve the quality of the data.
B. Results of round 1 expert survey and use in forecasting for ARVs up to 2010

The results of round 1, showing the various percentage usages, were presented in tabular and graphic form. Some of the key estimates were:

- That the use of dual therapy estimated to be from 8% in 2005 will decrease to 3% in 2010.
- That the “switching rate” (see discussion below) will increase from 5% in 2005 to 12% in 2010.
- That the use of PI in 1st line therapy will increase from 4% in 2005 to 10% in 2010.
- That in first line treatment the use of d4T will decrease from 75% in 2005 to 56% in 2010, and that the use of both ZDV and TDF in first line treatment will increase from 20% to 37%, and from 3% to 10%, respectively in corresponding years.
- That in second line therapy, the use of ZDV will decrease from 9% to 1%, and that of ABC will increase from 18% to 32%, between 2005 and 2010, respectively.

AMDS then showed what the results of these estimates, if correct might mean for the API production need between 2005 and 2010, when applied to the number of people estimated to be under treatment according to the low and high forecasts of the UNAIDS model (Table 2).  

1 As both the relative market share and number of people on treatment were estimated, this table should be interpreted with significant caution.
Table 2: Preliminary forecasts of needs of APIs in ARVs (in tons), produced by AMDS, November 2005

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2008</th>
<th>2010</th>
<th>Production capacity*</th>
</tr>
</thead>
<tbody>
<tr>
<td>D4T</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>19.0</td>
<td>48.7</td>
<td>67.7</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>30.3</td>
<td>103.8</td>
<td>134.8</td>
<td></td>
</tr>
<tr>
<td>ZDV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>56.3</td>
<td>231.7</td>
<td>376.4</td>
<td></td>
</tr>
<tr>
<td>High</td>
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C. Discussions on Round 1 expert survey and resulting forecasts

As it was planned to ask the experts to fill out the questionnaire on ART trends for a second time, extensive discussions on the results and on how to improve the survey.

The specific data for nucleosides suggested that patients were being given rational treatments. However, it was also found that there were some inconsistencies in the answers. For example, in the results on 2nd line drugs, the sum of the estimates for number of drugs used (nucleosides and PIs) was approximately 2.5, suggesting that part of the patients were receiving either dual therapy, or treatment regimens that included drugs recommended for first line use only.

The questionnaire did not ask explicitly which drugs were used for dual therapy. It became clear that the implicit assumption that only ZDV/3TC are used for dual therapy may not have been in accordance with reality, and that there was a need for an
Another key observation was that the questions on switching rates were not necessarily interpreted as expected. A long discussion was held on switching rates, including on the meaning of the term that was used for answering the survey (as an annual rate or as a cumulative market share), the reasons for switching (mainly toxicity and resistance) and whether there should be explicit questions in the questionnaire about the reasons for switching, and on the kind of question about switching that would be easiest to answer and also that would be most meaningful. It was argued that switching for any reason should be grouped together, especially if the switching is irreversible, in which case the reason is not important for forecasting purposes. However, it was pointed out by other participants that toxicity may lead to the switching of just one drug, whereas treatment failure generally leads to a change of the whole regimen. The irreversibility of switching for toxicity reasons was also called into question. Jean-Elie Malkin of Esther pointed out that the reason for the question - for forecasting purposes - is to find out the proportion of people on treatment who are on 2nd line therapy, but since the total includes naïve patients being newly treated, it may be necessary to know the real switching rate in order to calculate an accurate proportion. Due to the complexity of this issue, the net result of the discussion (elements of which are included in the Key Issues section) was to follow the suggestion of the Clinton Foundation, delete the questions on switching rates from the questionnaire, and use 6% and 10% as switch rates to second line therapy, based upon clinical data and experts’ assumptions: Year 1: 6% will move from 1st line to 2nd line; Year 2-Year 5: 10% will move from 1st to 2nd line each year.

The participants discussed other questions to be included in a new version of the questionnaire. One of the suggestions was that it would be more natural to fill out estimations by regimen rather than by product, with the data then easily convertible into APIs. Jos Perriëns emphasized the need to keep the estimations by product and not by treatment regimen, in order to capture the totality of the consumption. Using the treatment regimen approach would prevent having an idea of ARV consumption under irrational prescribing.

**Round 2 expert survey**

Following the discussion mentioned above, it was finally decided for round 2 of the expert survey to:

a. Exclude the questions on switching rates;
b. Add a question on the estimation of the drugs used in dual therapy;
c. Leave out the explicit listing of possible assumptions, letting participants use the results of the previous discussion in order to inform their views.

The participants took about an hour to fill out the new version of the survey at the beginning of Day 2; the results were subsequently compiled.

An analysis of the consistency between the round 1 and round 2 results revealed several observations:
• Round 2 results showed that dual therapy would continue to play a role, though a
less important one than after round 1 (round 1: drop from 8% in 2005 to 3% in
2010; round 2: drop from 5½ % in 2005 to 2% in 2010).
• Round 2 results showed a lower percentage of PI in 1st line treatments, and greater
usage of NRTI.

Some unexpected findings transpired from the analysis of the results, including in the
way many of the percentage uses of individual ARVs added up. For example:
• The total fraction of 1st line nucleosides/nucleotides should have been 1.0, but was
in fact less. It was commented that a drop in some should be compensated by an
increase in others. A suggestion made was to specify in any future survey that the
numbers must add up to 1.0.
• NFV showed a 90% drop in usage from 2005 to 2006.
• There was a lack of consolidation of ARV usage in 2nd line therapy.

One possible reason for these inconsistencies was that the experts had not had the
opportunity, when filling out the round 2 survey, to consult with colleagues in their
countries, as they had had for the first round organized prior to the meeting.

It was clear that the results of round 2 were not usable as is. It was therefore
proposed:
  a) to keep the results from round 1 for preliminary forecasting. Using only the
     round 1 results as the basis for the forecasting means that the process cannot
     be referred to as a Delphi survey.
  b) to discuss the options for improving the forecasting model and come up with a
     harmonized proposal and new forecasts. Given the limitations already
     encountered, the further query process would not follow Delphi methodology.
  c) to solicit input from various partners, such as UNICEF, on paediatric demand
type forecasts, the Partnership for Supply Chain Management (of PEPFAR)
for consumption data, and the Clinton Foundation on assumptions and
country consumption data, as well as other partners to express their possible
contributions.

Key issues

The following section highlights issues that were raised and discussed during the
course of the meeting, including during an open brainstorming session on how to
improve forecasts held on the morning of day 2. Many of the points raised concerned
elements and assumptions that could affect scale up rates and percentage usage of
ARVs. Understandably, many of the comments referred to obstacles that were
hindering scale up or the availability of the right ARVs to people in need. Much of
the discussion was therefore not purely about objective assessments of the expected
trends in real demand, but also of a more prescriptive nature, highlighting factors -
including operational ones - that need attention in order to better meet needs. For the
purpose of clarity, this section is divided into issues closely related to forecasting and
issues of a more operational nature that can also have an effect on forecasting.
A. Issues closely related to or affecting forecasting

- **Industry’s need for realistic demand forecasts.** As a general point, from an industry perspective, the need for realistic forecasts is paramount. Closing the gap between need and coverage is the central issue for global treatment of AIDS and requires that numerous obstacles be addressed, and the producers of ARVs need realistic forecasts of the actual demand at different points in time in order to ensure supply. Industry cannot make investments on the basis of targets. This point was well recognized by the organizers of the meeting and prevailed as a basis for future improvements in the forecasting exercise. It was pointed out by Donald de Korte of Merck that accurate forecasting can also lead to cost reductions by facilitating companies’ decisions to enter the market as new producers. Carlos Ramos from the Federal University of Rio de Janeiro, discussed how strong annual planning and forecasting in Brazil has benefited all players, including all members of the supply chain, and has also resulted in uninterrupted treatment for patients, leading for example to low rates of resistance.

- **Country-specific data and forecasting.** A major issue raised was the need for country-specific data and forecasting, due to large differences in the patterns of coverage and ART observed.
  - The question was raised early on as to whether it is reasonable to use one single scale up rate for all countries. The questionnaire was designed to determine the global percentage of each ARV used, but it was suggested that it could also be used to assess the effect of different parameters on the scale up rate. For example, in countries like Ethiopia and Rwanda, with a very low relative number of doctors, one cannot expect to achieve the same scale up rates as elsewhere. Another example cited by Felipe Garcia of Médecins sans Frontières was Guatemala, where there is a large difference in testing capacity between urban and rural locations.
  - It was also suggested that certain countries should weigh heavily in the projections because each one represents a sufficiently different situation. Aside from Brazil, which is already recognized as presenting a unique situation, Nigeria, China and South Africa were explicitly mentioned.
  - It was felt by several participants that the questionnaires should be filled out in consultation with individual countries, at a very local/regional level, in order to take full account of the different country-specific factors. Isaiah Tanui, ART Manager with Kenya’s Ministry of Health stressed that forecasting needs to be built into country processes. Improved surveillance within countries can lead to improved data on needs, as was suggested by Vadim Pokrovskiý, Chief Federal Scientific-Methodical Centre on AIDS Control and Prevention, Russia.
  - It was also mentioned by Lorraine Hill of Aspen that greater country-specificity in the forecasts allows companies to better prepare when it comes to aspects like registration and labelling.
  - In line with their own forecast results and with the other points raised about country-specific data, the Clinton Foundation recommended that demand estimates be broken down by country, at least for the top 11 representing 80% of the volume. Scale up rates should be determined on a country-specific basis and then classified.
  - In summary, these comments converged in suggesting that, in improved models, the global level estimates of consumption trends should be
replaced to the extent possible with country or programme level estimations, both for future consumption forecast and its breakdown over different drugs or formulations.

- **Transaction driving consumption.** There was a discussion centred on the danger of self-perpetuation of transactional data. It was pointed out that the databases discussed contain three kinds of data: transactional, consumption and needs assessment. The issue raised was that transactions can drive consumption. For example, if a country neglects to purchase enough paediatric drugs, parents will not bring their children for treatment, consumption data will not rise, and procurement will subsequently not rise either. The implication was that past transactional data may not always reflect latent need for which availability is the primary obstacle.

- **Funding and pricing.** It is clear that reaching the goal of universal access to ARVs in low and middle income countries is critically dependent on funding. It was underlined early on by Robert Greener that the forecasting is not based on expectations of available funding, but rather, the amounts pledged are used to calculate the financing gap for advocacy purposes. For this reason, the overall approach adopted was not to consider funding as an obstacle to access. The expense of drugs was nonetheless an issue mentioned repeatedly during the meeting. Elsa Palou from the Ministry of Health in Honduras called attention on several occasions to the lack of funds to purchase all the drugs needed. Also, as mentioned above, Anil Soni considered that price elasticity is a very real phenomenon that can have a major effect on prescribing patterns, and it needs to be taken into account in the forecasting model. Donald de Korte, on the other hand, disagreed with the price elasticity hypothesis.

- **Registration.** One of the persistent obstacles to ARV access is the maintenance of complete drug registration requirements in individual countries. It was evident from discussions that the extensive registration process is often the rate-limiting factor in the introduction of ARVs to a population. Robert Webster of Gilead Sciences mentioned the slowness of the registration process in some countries and asked for simplified registration requirements, especially for drugs that have already been approved by the FDA, such as fast-track registration. WHO provided information on the guidance available from WHO QSM for a short dossier that can be fast-tracked.

- **Diagnostics.** While it was assumed in the existing models that testing requirements would not be limited by capacity, it was nonetheless mentioned repeatedly that the number of patients counted as being in need of treatment depends very much on the availability of diagnostic procedures and materials, and there was therefore a need for the scaling up of medical resources, such as PMCT (Prevention of Mother-to-Child Transmission), in order to be able to scale up forecasts. In Kenya, for example, ARVs had to be returned because of a lack of diagnostic tests. Laboratory capacity was also mentioned as an issue by Charles Kouanfack from the Ministry of Health of Cameroon. Anthony Amoroso of Catholic Relief Services suggested that an increased use of viral load indicators can facilitate scale up.

- **Resistance to 1st line treatment.** This is a major factor in the switching from 1st to 2nd line treatments, and it was suggested that it should be considered in the forecasting model. It was also pointed out that in countries with greater access to ARVs, there will be higher failure rates because of longer periods of treatment. Felipe Garcia pointed out that in resource-limited settings, there are often no
resistance data available, and therefore clinical symptoms are used to ascertain if a
treatment is not working and a switch in therapy is needed.

- **Drug toxicity.** It was recognized that toxicity is often a more important reason
  than resistance for switching from 1st line to 2nd therapies, and that it is probably
toxicity that will drive demand. Jean-François Delfraissy, Director of ANRS
  (France), pointed that patients being treated in 2005 with ARVs will continue to
  receive treatment in the long run. AIDS is a chronic disease, and there is a need to
  be thinking ahead to this situation, when toxicity will be a greater problem. Anil
  Soni suggested that the clinical parameters for the forecasting model should take
  into account questions regarding the way prescription guidelines are likely to
  change as a function of factors such as toxicity.

- **Patient data.** It was recommended that modelling take into account various
  parameters, including in particular patient clinical data, that are used to simulate
  likely outcomes such as resource needs and patient capacities. The output can be
  used as a planning tool and help to predict bottlenecks. The Clinton Foundation
  placed great emphasis on signalling cases or situations where supply and demand
  differ.

- **Paediatric use.** There is a need to adapt procurement planning for paediatric use.
  An example was given of how the use of syrups can lead to wastage without
  proper planning, and how information is needed on liquid stability after opening.

- **Co-infections.** The incidence of TB among AIDS patients can have a major
  effect on drug prescription patterns. TB is often treated first before ARVs are
  prescribed. The relevance of TB co-infection to forecasting was brought up by
  several participants, including Elsa Palou and Felipe Garcia. Jean-Elie Malkin also
  pointed out the relevance of HBV co-infection, since in the case of active hepatitis
  the 1st line regimen should include TDF in addition to 3TC. In countries with a
  high prevalence of HBV infection, including south-east Asia and many countries
  in Africa, there will probably be an increasing need for TDF as a 1st line drug.

- **Pregnancy.** Pregnancy rates are a factor that affects ARV usage and needs to be
  taken into consideration.

- **Other applications of ARVs.** The needs of ARVs for mother-child prevention
  and for post-exposure prophylaxis should be taken into consideration.

- **Guidelines, training.** It was mentioned that the number of patients treated can
  sometimes depend on whether usage guidelines are provided. In a similar vein, it
  was mentioned that some formulations need to accompany training, even for
  generic drugs.

- **New formulations.** It was mentioned that the introduction of new formulations
  not requiring refrigeration could affect the availability of an API, with shipment
  possible, for example, to Africa within about one year after development, once
  registration is completed.

- **Government initiatives.** It was mentioned that an ambitious government
  initiative can dramatically increase scale up, as in Nigeria and other African
  countries, and that this needs to be taken into account in forecasting.

- **Pressure to use certain ARVs.** The problem of pressure placed by
  pharmaceutical companies in some countries to use certain ARVs rather than
  others, was pointed out by more than one participant. The result is a skewing - in
  terms of forecasting - of usage away from what would otherwise be expected if
  WHO guidelines were followed.
- **Self-administration.** Felipe Garcia mentioned that, in the same way that insulin became self-administrable years ago, it can be anticipated that ARVs may become easier to administer; this situation that could have an impact on scale up rates.

- **Compliance and adherence rates.** These are factors that can also have an indirect effect on forecasts. For example, low adherence tends to lead to increased failure, resulting in an increase in the use of 2nd line therapy.

- **Precision of small numbers.** A potentially important point which may sometimes be overlooked was brought up by Robert Dintruff of Abbott. The difference between an estimate of 1% and 2% of 1st line therapy recipients may not seem that significant, but it may represent a very large difference in terms of the overall volume for a given product. A lower volume 2nd line drug that is forecasted for use 2% of the time across 5 million 1st line patients will require manufacturing for an additional 100 000 patients. Attention needs to be paid even when estimating relatively low percentages of ARVs because it could significantly increase a product volume requirement.

**B. Issues of a more operational nature that can also affect forecasting**

- **Industry’s need for increased coordination.** In line with earlier remarks by Anil Soni about the need for coordination with industry, Robert Webster stressed that resources could be used more efficiently and the availability of ARVs increased if there were a better flow of information, and he urged for improved reporting through a concerted channel. As an example, Donald de Korte mentioned Brazil’s IT-based patient management system. Elsa Palou also stressed the need for continuous communication between WHO and individual countries to see practical successes over time. One participant also mentioned that donors do not communicate and coordinate with each other in some countries, leading to either excess or insufficient supply. Donné Newbury of BMS suggested that a confidential survey of each manufacturer to understand regulatory plans and capacity may be of value.

- **Order size.** One of the key points of discussion concerned the effect of large orders on supply. There was a request to be able to better manage “big surprises”, such as the sudden availability of large-scale funding and a consequent surge in demand. The industry perspective is that it is better to have more frequent purchases in smaller quantities, as large orders without warning can deplete supplies, and country-specific labelling requirements and differences in formulations are additional factors that increase lead times. The point was raised that governments tend not to work like that, especially when they depend on money received from sources such as the Global Fund, and it was asked whether companies could signal if shortages were imminent. A remark from The Clinton Foundation was that large orders can in fact lead to lower prices, but they need to be planned. Robert Dintruff held up Brazil as an example of the success of providing forecasts that are then modified as a function of new needs or data.

- **Operational decentralization.** It was argued that the management of ordering and stock levels should be carried out at the lowest level, with information flow in both directions.

- **Sharing of production.** Marcos Cruz of Nortec Quimica (Brazil) expressed the desire for a sharing of production between different suppliers because of the large volumes of starting materials that need to be procured. He also pointed out that production capacity does not increase linearly but rather jumps with the construction of new facilities and plants.
• **Over-purchases.** There have been cases where countries purchased more ARVs than needed or than they could make available to patients in need, leading to wastage. This is also a misallocation of resources that can impact on the credibility of the forecasting.

• **Patents.** Although patent issues were not a major focus of the discussion, it was pointed out that patent problems can still remain an obstacle for future availability of ARVs and the meeting of API needs in relation with universal access efforts. Developing countries with manufacturing capacity, such as China, need to be encouraged to manufacture more generic drugs and APIs, while the pharmaceutical industry needs to continue to take steps to ensure that patents are no obstacle to treatment access in developing countries.

• **Advocacy.** Although the discussions were directed towards developing an accurate demand forecast for suppliers, participants were well aware of the role of forecasting for advocacy purposes. Anil Soni pointed out that it would be helpful from an advocacy standpoint to be able to demonstrate explicitly the size of the market from a needs point-of-view, and pinpoint the bottlenecks that are preventing access. Ultimately, this is how the goal of universal access for those in need will be reached.

### Summary and Next Steps

There was a consensus reached on several key points, including the following:

- The participants agreed to move the process forward to refine the forecasting model and produce a demand forecast by the end of January 2006, with a harmonized and coordinated process among partners, and inclusion of country-level reports and planning data.
- It was also agreed that the forecasting model should, at a fundamental level, take into consideration diagnostic needs.
- It was agreed that there is a need for ARV paediatric formulation demand-type forecasts and that UNICEF will contribute to their production.
- CHAI, currently looking at an extended set of indicators in order to determine which factors predict scale-up and bottlenecks and where more attention is needed, proposed to contribute research results to the joint forecasting process.
- It was agreed that there is a need for innovation in ARVs, and that this also needs to be taken into consideration in updating forecasts.
- It was emphasized that this is a continuous process that will lead to regular improvements. Subsequently, the forecasts will be reviewed annually using updated ARV consumption data, parameters and country data.

The next steps agreed to are as follows:

- To create an open working group, including a very technical sub-group, charged with the task of refining a model for demand forecasting and using this model to forecast ARV needs. The group will look at all the issues and points discussed during the meeting.
- WHO will ensure the coordination of the group. During the meeting, organizations such as UNAIDS (and its contractor INSP Mexico), UNICEF, the Clinton Foundation, the Partnership for Supply Chain Management, JSI deliver and MSH/RPM Plus expressed their interest in participating in the open working
group. Other organizations would be free to participate if they can make a contribution. All participants and the observers from the pharmaceutical industry will be informed regularly on progress and will be able to provide feedback. A “firewall” would need to be created to rule out conflicts of interest.

The first draft of a demand forecast will likely be produced by the end of January 2006, and will be shared with all participants, observers, and ARV producers known to the AMDS, and in a second step in the public domain. This process will enable WHO and UNAIDS to continue to exchange information with all stakeholders included those not represented at this meeting. The forecast will be further refined in order to reach a final product prior to the World Health Assembly in May 2006 and the XVI International AIDS Conference in Toronto in August 2006.
Appendix

On the following pages are the agenda of the meeting and list of participants.

Other relevant documents, including meeting presentations and the questionnaire, can be found at the following link:
WHO / UNAIDS meeting  
Forecasting for antiretrovirals up to 2010

7-8 November 2005  
Centre de Conférences de Varembé (CCV)  
9-11 rue de Varembé, Geneva

Agenda

Chair: Pr Pokrovskiy  
Facilitator: Benjamin Nkowane, WHO

Monday 7 November 2005

Open meeting in presence of observers from pharmaceutical industry

08:30 Registration

09:00-09:05 Chair’s welcome

09:05-09:15 Opening remarks  
Teguest Guerma, Associate Director, HIV Department WHO  
Peter Ghys, UNAIDS Secretariat

09:15-09:35 Introduction of participants

09:35-09:55 Overview of meeting: objectives and methodology  
Joseph Perriëns, Coordinator, AIDS Medicine and Diagnostics Service (AMDS), WHO

Questions and clarifications

09:55-10:15 Scenario of number of people receiving treatment between 2005 and 2010 in low and middle income countries  
- Robert Greener, UNAIDS Secretariat  
- Anil Soni, Seema Arora, Clinton Foundation HIV/AIDS Initiative
10:15-10:30  **Baseline consumption of ARVs in low and middle income countries in 2005**
- Baseline consumption from Global Price Reporting Mechanisms, in Brazil and in Clinton HIV/AIDS Initiative procurement,
  Eloan Pinheiro, AMDS Secretariat

10:30-11:00  Refreshment break

11:00-11:20  **Baseline consumption of ARVs in low and middle income countries in 2005 (continuation)**
- Baseline consumption in PEPFAR procurement, AMDS Secretariat
  Laila Akhlaghi, MSH
- Baseline consumption for children in Clinton HIV/AIDS Initiative procurement
  Seema Arora, Clinton Foundation HIV/AIDS Initiative

11:20-12:15  **Discussion**

12:15-12:30  **Presentation of results of round 1 of the Delphi survey**
- Proportion of 1st/2nd lines, Trends in 1st and 2nd line drugs for adults up to 2010
  Joseph Perriëns, Coordinator, AIDS Medicine and Diagnostics Service (AMDS), WHO

12:30-14:00  Lunch

14:00-14:15  **Forecasts for ARVs up to 2010, using round 1 assumptions**
  Modeller: Juan Pablo Gutierrez, Mexico

14:15-15:30  **Discussion on model assumptions, trends and forecasts**
  Moderated by Benjamin Nkowane, WHO

15:30-16:00  Refreshment break

16:00-17:00  **Comments by observers from pharmaceutical industry**
  Discussion

17:00-17:15  **Wrap-up Day 1**
  Chair
Tuesday 8 November 2005

Closed session (no presence of observers from pharmaceutical industry)

09:00-10:00  Delphi survey Round 2 (questionnaire to be filled out by experts)
10:00-10:30  Refreshment break

Open session

10:30-12:30  Discussion on how to improve future forecasts
Joseph Perriëns, Coordinator, AIDS Medicine and Diagnostics Service (AMDS), WHO
12:30-14:00  Lunch
14:00-14:20  Presentation of results Delphi survey Round 2
Joseph Perriëns, Coordinator, AIDS Medicine and Diagnostics Service (AMDS), WHO
14:20-14:40  Presentation of forecasts of ARV needs in low income and low middle income countries up to 2010
Modellers: Juan Pablo Gutierrez, Stefano Bertozzi
14:40-15:30  Discussion
15:30-16:00  Next steps, milestones, and closing
Chair & Organizers

16:00  Refreshment
WHO / UNAIDS Meeting
Forecasting for antiretrovirals up to 2010
Geneva, SWITZERLAND, 07 - 08 November 2005

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