

## **2006 International AIDS Conference: Achieving Access to Prevention, Care and Treatment August 15, 2006**

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[START RECORDING]

**HECTOR PEREZ:** [Inaudible] degree in economy from Harvard University, M.D. from [Inaudible] Medical School and [Inaudible] School of Business [Inaudible]

**PETER MAZONSON, M.D., M.B.A.:** Good morning, everyone. Well, we were told that the plenary session ended a little late and then Bill Clinton is speaking right after us. While we're all very proud of what we're about to say, we figured we didn't want to wait too long to get started because we thought that people might want to hear Bill Clinton instead of us so we, we thought we'd get started and then I'm sure people will join us as the session goes on.

So it's a pleasure to be here to speak about cost effectiveness of initiating and monitoring HAART based on WHO verses USDHHS to permanent Health and Human Services Guidelines in the developing world. So when I give this talk I'm giving it not only for myself but my colleagues both from the United States and South Africa who worked hard on this project.

Okay, our main study objective was to evaluate the cost effectiveness of really true approaches for initiating care for HIV patients. The first HAART occurring WHO three by five guidelines, which I'm sure you're all familiar with and the second is what we'll call composite guidelines. These are really composite guidelines in that we started with the WHO guidelines, but we made three major modifications to those guidelines based on techniques for initiating therapy that are more commonly used in the developed world and the

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developing world and we used the USDHHS panel on clinical practices guidelines as our template for those changes.

There are basically three main changes that we made. One is instead of initiating HAART at a [inaudible] count of 200, we bumped that up to initiate a HAART at a higher [inaudible] count of 350. Instead of initiated HAART based solely on CD4[misspelled?] count as in the WHO three by five guidelines, we also said that treatment would be initiated if the viral load was about 100,000 copies per milliliter and as far as frequency of testing instead of testing every six months with CD4 count alone, as for the WHO guidelines for testing every three months with both viral load and CD4 count.

In terms of the methods of the model used, this was a [inaudible] perspective. For those of you who are into modeling, it was a lifetime [Inaudible] kind of model that incorporated HIV transmission. By that I mean that we looked not only at cost effectiveness for the index patient if you will, but also people to whom that index patient might transmit the virus. Our starting population was adults between the ages of 15 and 49, who are heterosexual treatment [inaudible] HIV positive and living in South Africa. We chose South Africa because there are more people living with ADIS in South Africa than any other country and as far as the constant we used for our base case model, we used South African cost data but we converted that to 2005 U.S. dollars.

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In terms of the outcomes of interest, we used quality adjusted life years. We looked at both direct medical costs and one of the unique aspects of this study is we also looked at indirect costs which we'll talk about a bit later. We looked at incremental costs for quality adjusted life year and again, as I mentioned, we reported out the results both for the index patient and other patients or persons to whom he or she might transmit HIV. And we also not only looked at cost effectiveness, but we did what's called a budget impact analysis where we looked at if you were to move from the three by five guidelines to the composite guidelines, what would be the economic impact for South Africa in our model. We looked at that in both the five-year look and a lifetime look.

The study was done with a number of international experts in both clinical AIDS and health economics including [Inaudible] from South Africa, as well as Dick Hellmann from the Gates Foundation and Jillian Saunders from Duke University.

For those of you who are not fully familiar with these kinds of models. Any medical journal article that [inaudible] is required to add this drawing and basically the boxes that you see there, the rectangular boxes represent health states and the arrows are basically allowed transitions between those health states and so basically every month patients can move from one box to another. On the left basically what you've got is patients starting in various [inaudible]. They can either start with a CD4 count greater than 350, start with a CD4 count between 200 and 350 with symptomatic HIV

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or AIDS or start with a CD4 count less than 200 with symptomatic HIV or AIDS and then they get initiated on therapy and they can either respond and get a virologic response or not and then once they respond, they can either stay as a responder, become a nonresponder during in any cycle in the model or die.

So in any model, you have to make some key assumptions and I thought I would go through some of the key assumptions in the model cause they're important to understanding the results. The baseline data surprised the distribution of patients in the various CD4 and viral load buckets, came from Dr. [Inaudible], both his published data and some personally supplied data, [Inaudible] I wish he could be here but he's chairing another session at the same time. The risk of disease progression is based both on viral load and CD4 cell counts and all HIV related deaths occurred among patients with AIDS.

In terms of the treatments that were used for both arms of the model, we used the treatments as set forth in the WHO three by five guidelines. And in terms of the probability achieving successful virologic suppression or response, basically patients would be put on first-line therapy. If they failed first line therapy, they would go to second-line therapy, which they would have a lower chance of responding to. But they could also be on first-line therapy and develop toxicity and if they develop toxicity as for the WHO guidelines, there's an alternate regimen used and we assume that people switched purely for toxicity would have the same

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chance of responding as they would to the initial regimen that was used.

Is this the alphabet soup for the WHO three by five for first line and second line treatment and also includes what we call alternate first and second line HAART, again that's for patients who develop toxicity of first line. We did not assume three lines of therapy because the WHO only has two lines of therapy stipulated and because the developing world treatment is relatively new so there's a small number of patients who are at that point.

In terms of identifying treatment failure, again in the WHO, in the model we assume that treatment failure was defined as a CD4 count that was less than 50-percent of the peak value or a CD4 count of less than 200 cells, whereas in the composite guidelines basically if the viral load snuck up above 400 copies per milliliter it was considered a virologic failure.

As far as transmission goes, again, as I mentioned, we incorporated not only the index patient, but the patients to whom that person would transmit and the rate of transmission depended on the infected patient's sex, their number of sexual partners and the viral load. Reductions in viral load, as you all know, reduced the risk of HIV transmission and that's true in the model. And we didn't look at the impact of other ways to reduce transmissions and the transmission in the model like testing and counseling.

So, here in the results, here are some of the key results from the model. First I'm going to present this says index patient

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only, what that means is these are the results just for the index patient without including patients to whom that person might have transmitted the virus. And basically what you see is if you compare the current WHO three by five guidelines with the composite guidelines over a lifetime it costs quite a bit more to treat with these composite guidelines, but the advantages that people on average live longer and that's reflected in this 2.09 increase in quality adjusted life years such that the incremental cost effectiveness ratio, which is cost per quality adjusted life years just below \$5,000. And as we'll discuss in a minute, that's quite a cost effective results.

We then did the same analysis, but this time included transmissions of both the index patient and the persons to whom they might transmit the virus. In this case the costs go up but also the effectiveness goes up when we apply that increased life expectancy for the transmitted to patients back to the index patients. So the cost per quality adjusted life year drops to a little under \$4,000.

We then tried to tease out another key thing, which is, as I mentioned, the composite guidelines are really different in three ways. So we looked at each of those three ways separately, which was, what about if we just bumped up the threshold for CD4 count, but didn't do viral load, or what's the contribution of looking at viral load or what's the contribution by itself from just testing more frequently and as you can see about half of the benefit we derived in the model is from just bumping the CD4 threshold from 200 to 350 and

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the other half is from viral load and more frequent testing. But you notice the incremental cost effectiveness ratios in red there are all below \$4,000 and that's again, considered a highly cost effective result, which we'll touch on in a minute.

So we also looked at the budget impact for South Africa. What if we were to do this in South Africa, to move from WHO guidelines to these composite guidelines? The reality is that direct cost would go up, mostly because a lot more patients would be treated but the benefits over five years would be quite striking with 400,000 fewer deaths, a million fewer AIDS cases and many fewer incident HIV cases.

We then did the indirect cost analysis. To our knowledge, very few others have looked at indirect costs in these kinds of models in the developing world. And so basically we looked at indirect cost phase related death for both index patients and that should also say and for the patients to whom they transmitted HIV. And the way we figured out the indirect cost per patient was taking the GDP per capita in South Africa and multiplied that by the difference in years of life between those in the model who were treated as per the composite guidelines verses the WHO guidelines.

Now, some people would argue that indirect cost analysis in developing world settings doesn't make sense because so many people are unemployed. But by looking at

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average GDP per capita, we're basically looking at the average product [inaudible] employee in that economy taking into account those who are employed and those who are unemployed. In the potential years of life lost were calculated by subtracting the average age at which an individual died if they were treating under the composite guidelines verses when they would die if they were treated under the three by five guidelines.

So based on that we found a very intriguing result and this [inaudible] the lifetime of the model which was about 38 years and that is that even though it would cost a lot more to treat this way, in fact \$62 billion more in direct medical costs over 38 years. The reality is that the South African economy would save a tremendous amount of money through the increased productivity of doing this. So I guess you would say that on net there would be a \$61 billion savings or short-term pain for the long-term gain, which is really what's happened in a way in the developed world where we've managed to turn this into more of chronic illness.

I won't go through all the details but we did extensive sensitivity analysis to try and understand what are the key parameters that might affect the model and the bottom line is these [inaudible] quite robust to these sensitivity cases. We did that both for the index patients and for transmitted patients.

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And so what I'd like to wrap up with in conclusion is that even without including indirect costs, the results that we got for using the composite guidelines were highly cost effective and I don't define highly cost effective, but the WHO defines highly cost effective as intervention where the cost per quality or incremental cost effectiveness ratio is less than the GDP per capita, which in 2005 for South Africa was \$4,900.

Furthermore, when we looked at each of those three components separately, there were all cost effective by themselves and in fact, if you were to initiate this over the lifetime of the model, 38 years, throughout South Africa, you would actually save quite a bit of money when you include indirect costs so we think this is also important not only for South Africa but also could be extrapolated to other upper middle income countries. So I'll stop there. Thanks very much.

**HECTOR PEREZ:** We have two minutes to questions open to discussion [inaudible].

**MALE SPEAKER:** [Inaudible] from France. First, Peter thank you very much because I remember that only four years ago in Barcelona we had to fight against the misuse of cost effectiveness and that is against the priority to universal access to treatment and I'm very pleased to see a correct use of cost effectiveness. And that is in favor of finding the

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optimal way to increase access to treatment, so thanks for that. And then the question, because it's unclear what is your result in terms of best most cost effectiveness threshold for starting therapy because in the north we find that the later we start, the cost effectiveness ration deteriorates in all the studies. But contrary to that, the antiviral therapy paper, which was published by Susan Cleary and others based on the real data, in South Africa, find that for many reasons it's more cost effective to start at 200 than starting earlier in that context. So what are your results on that in the model?

**PETER MAZONSON, M.D., M.B.A.:** Right. So this is not the only study that's been done in this area. Cleary did a nice study, Badry [misspelled?], Bachman and some others have the study. The devil's in the details. I think part of what makes this study unique if I were to say two things about it. One is the inclusion of the transmitted to patients. For example, with viral load, since we know that viral load is such a key factor in transmitting the virus, if you don't look at that transmitted to group, you lose a big chunk of the cost effectiveness and also the inclusion of indirect costs.

So to be clearer, our recommendations are that while we understand that for a country like South Africa, they may not feel they can afford to do this, the most cost effective solution in terms of the WHO criteria would be to implement all three of these changes

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which is bump the CD4 threshold, include viral load as a threshold and also monitor more frequently.

**HECTOR PEREZ:** Thank you. The last question and microphone one.

**CHRISTINE PENNANTS [misspelled?]:** Hi, my name is Christine Pennants and I'm from South Africa and I'm with [inaudible]. I'd like to know if you've presented those results to the South African government, and if yes, what their response was. Do you know any indication that they're planning to look at this [inaudible] and implement it? And if not, if you're planning to do so.

**PETER MAZONSON, M.D., M.B.A.:** The answer is no, we have not, we would love to do so. We thought we'd try it out on this audience first and if you liked it, then we'd present it to them. But if you can help facilitate us presenting it, we would love to do that.

**HECTOR PEREZ:** Thank you. Thank you, Peter. The second presentation is from Pharmaceutical Patents and Access to HIV/AIDS Treatments: The Brazilian Experience." The presenter is Dr. Constance Meiners. She is a head economist working on the [inaudible] in Brazil. She has been involved in the [inaudible] rights since 2001. Thank you, Constance.

**DR. CONSTANCE MEINERS:** Thank you, it's a great pleasure to be here talking to you today. I'm going to talk about pharmaceutical patents and access to ART in Brazil, which was the topic of my Master's dissertation at the University of York and resulted as

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research done in France in collaboration done with [inaudible].

Well, first of all according to the World Health Organization only 15 people of people in need of ART in the developing world have access to it. Although, not the main barrier, one of the main causes is the high prices of antiretrovirals.

So the question behind our research was, how much fat is due to patent protection? Pharmaceutical patents play a dubious role. In one hand they provide medical incentives to medical therapy innovation, which is important to decrease morbidity and mortality rates but on the other hand they give monopoly power which puts upward pressure on prices and therefore limit access. During the [inaudible] negotiations that [inaudible] rights, industries claim came forward and there was increased protection of pharmaceutical patents worldwide.

One of the aspects the study in the work was how is the market structured for ARVs? It's highly, basically an oligopoly, where you have 27 ARVs launched between 1987 and 2008 and [inaudible] classes. They belong only to eight pharmaceutical companies and an interesting factor is that the top 10 ARVs sold in the global market belong only [inaudible] 86-percent of the market share and belong only to six companies. It's estimated that there are about 600,000 living with HIV/AIDS in Brazil. The Brazilian program initiated in the early nineties provides therapy free of charge for 170,000 people.

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The main strategies of this program are local production associated with the import of raw materials from India and China, which are believed to have decreased prices by 80-percent. Also, it's based on the centralized procurement, which improves the means of negotiations and helps decrease prices by around 65-percent. And more recently since 2001, Brazil has used the compulsory license threat also as a means of our gaining power. The results, the decreasing price obtained by the Brazilian program had strong spillover effect all over the developing world, not only through improved negotiation, the attention of the international community but also through providing cheaper known [inaudible]. Yet the main challenge remains; the virus mutation, the resistance to treatment which leads to venue to buy new and patented drugs.

For instance, in Brazil in 2003 and 2004, patented drugs comprised 80-percent of the budget of the program. So, the Brazilian program provides 17 ARTs and one combination of AZT3TC, eight of them are locally produced, the ones which have the single—the massive use in this research, we obtained data on prices from the transactions at the [inaudible] program of the French National Agency for AIDS research database on 188 effective transactions from 1998 to 2002. We used standardized source prices and quantities converted to U.S. dollars at the time of purchase, using cost insurance and tried prices. Patents status was obtained both from the [inaudible] informal consultations with the Brazilian HIV/AIDS Program, as well as the industrial property national institute in Brazil.

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For the statistical analysis we used both descriptive and linear regression. The dependent variable was the log of price for daily doses for naïve adults weighing over 60 kilos and the explanatory variables were the year of transact, quantity purchased, number of suppliers, whether a monopoly or more than one provider, drug [inaudible] whether branded or non branded, therapeutic class including the first three [inaudible] class and RTIs and NRTIs and [inaudible] inhibitor, nature of producer, whether public or private, line of therapy, patent status and age of drug meaning that years in excess of FDA approval.

In the first glance, the results we obtained was a gender of 65.1-percent decreasing price from 1998 to 2002. However, [inaudible] trend was declining, we saw now statistical difference between the results for 2000 and 2002, which indicated some kind of stabilization and the decrease of prices. Also, we saw the relevance of patent within [inaudible] classes [inaudible] and the case for NRTI where most of the IRTs are off patent, it's the combined price is much cheaper whereas as you move to an NRTI where you have two unpatented drugs, the prices start increasing and it's much higher, but when you don't have any optional medicine without patent, which is the case like [inaudible] in Brazil so our options for protease inhibitors are on patent.

So it's interesting to notice from the results that second line therapy costs about 1.6 times more than first line therapy on the mean. Also on patented medicine cost 3.2 times more than off

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patent medicines. Branded are about four times higher than unbranded and monopoly providers prices are 3.4 times higher than nonmonopoly case. From the most [inaudible] progression results, it's also interesting to see like three only variables that showed a statistical significance in this case were the drugs characteristics, therapeutic class, patent situation and age of drug. It's interesting to notice also that the changing price showed to be sensitive in about 21-percent to patents, so it does indicate that patents have an effect on price. And the foreign access to medicines.

The main conclusions that we reached was that generic [inaudible] enforced by local production of drugs has been a key determinant of ARB [misspelled?] price decrease and access to medicines in Brazil. In Brazil, it was highly based on the possibility of importing active principles from India. Since from 2005, India has fully abided to trips and the question is raised of how is that going to effect access to new patented ARTs or even [inaudible] in Brazil. So, increasing patent protection [inaudible] to the sustainability of access of ART in developing countries. But we cannot ignore the importance of patents to scientific and [inaudible] development so the challenge remains in securing access to top ART in the long run as patients are shifted from one line of therapy to the other.

The policy recognitions have [inaudible] are the full use of [inaudible] flexibilities, which as in regarding also the

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victories obtained since [inaudible] 2001 which means the careful examination of the patent application, [inaudible] extensive protection, also the use of parallel importing, when that is the case and voluntary and compulsory licenses, which have been very successful in Brazil.

Also it's important that the country invests in human capital, local manufacturing capacity and research and development. Difference of pricing has been discussed as a means of extending coverage to third world countries, yet there is a full reliance on the provider of the these drugs. Centralized procurement strategy in Brazil was also a key factor, concentrating power for negotiation in the government and other means are [inaudible] cooperation and [inaudible] of public opinion. Thank you.

**HECTOR PEREZ:** Thank you, Constance. We have four minutes for questions. Let's open the discussion. Microphone two.

**DAVID GRUEY[misspelled?]:** Hi, David Gruey from Merck Pharmaceutical Company [inaudible] Brazil and elsewhere. First of all, Brazil needs lots of commendation from the world for what you've done in prevention, care and treatment, it's really a wonderful program. Second, some facts, very briefly, 95-percent, approximately of antiretroviral drugs are off patent, are not patented in the developing world. About 99-percent of essential drugs established by the WHO, so patents is one factor but clearly very insignificant. What I'm curious about is, does your study look at all the impact with your policy recommendations, what the impact might be on further

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research and development in the area of antiretroviral drugs for [inaudible] other medicines?

**DR. CONSTANCE MEINERS:** Sorry, the last point is not so clear.

**DAVID GRUEY:** Sure. What seems to be missing, you've made a compelling case about the need for lower prices and different strategies the Brazilian government has taken. Although, as you've said it has not actually – gives any compulsory license. But my question is did your study look at or should your study have looked at the effect on future research and development into antiretroviral medicines, given what you said earlier about the importance of resistance in HIV AIDS medicine of treatment?

**DR. CONSTANCE MEINERS:** [Inaudible] the answer.

**MALE SPEAKER 1:** [Inaudible] scientifically you need to get data from the drug companies and to my knowledge, there's only one group, which is allowed to do that it's the group of [inaudible]. The only quoted source at international [inaudible] and I respect these people but everybody knows that 95-percent of their funding comes directly from their companies so the day where the drug companies, including Merck would accept that an independent panel [inaudible] and really [inaudible] will have a big advance [inaudible] also in policy. So open your books and we'll do that.

**DR. CONSTANCE MEINERS:** Thank you.

**HECTOR PEREZ:** Microphone one.

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**MALE SPEAKER 2:** Hi. [Inaudible] from China. I have a comment and a question. Comment in response to our friend from Merck. In fact, [inaudible] is patented in China and the current price is a severe limitation on people's access. You could speak for the member of the Chinese government who's here and knows as well. The question, did you look at all at the access to raw materials and the APIs that are currently coming from India and China, and have you assessed numerically the limitations that Indian patent laws might have on Brazil's access to those APIs?

**DR. CONSTANCE MEINERS:** Yeah, well, the detail we had was limited to 2002, so the idea now is that we further get data up to at least 2005 to try to assess what the impact would be to the enforcement of pharmaceutical patents in India from 2005. So, I'm sorry, we'd love to do that but with the limited data we could not. And also in regards to the first gentleman's question, the use of the policy recommendations that are given do not, against patents. You know, Brazil has no inclination of breaking patent law, to the contrary, we do respect that we just want to use the flexibilities in trips that are allowed to push down prices, that's all. Because when you have 80-percent of your budget committed to three drugs, you know, that's very serious.

**HECTOR PEREZ:** Okay. Thank you, Constance. I would like to introduce my co-chair, Antonieta Lara, she's working in the United Kingdom. Thank you, Antonieta.

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**ANTONIETA LARA:** Thank you, Hector. The next presentation is Negotiating Antiretroviral Drug Prices to Increase Access: Challenges and Opportunities by Dr. Enrique Vazquez. He's an assistant professor at the College of Pharmacy and the School of Public Health at Ohio State University. He has worked extensively in health economics, pharmaceutical economics and policy. He has also conducted research projects for a variety of international organizations such as [Inaudible]. Dr. Enrique.

**ENRIQUE VAZQUEZ, Ph.D.:** Well. Okay, thanks. Thank you very much. I will present today the [inaudible] experience of negotiating antiretroviral prices and we will see some challenges and opportunities that are happening in that negotiation.

The price of antiretrovirals is an important barrier to access. In the early 2000s, the entrance of generic combinations in the pharmaceutical markets produced a reduction in the [inaudible] prices. Nevertheless, developing countries continue to pay high prices [inaudible]. Price negotiations are one of the ways the countries can reduce prices and also increase pharmaceutical quality and this, the area we will see today in this presentation.

Several price negotiations have appeared to date. We have the initial [inaudible] negotiations in Brazil that was started in 1996. Another example can be the [inaudible] Access Initiative in 2000s; it was also a country-by-country initiative between [inaudible] 2003, in the Caribbean with the specific pharmaceutical companies. And also, we have several multinational negotiations that

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[inaudible] in Latin America, including the Caribbean countries in 2000 and in Central American countries in 2003, the Indian countries in 2003 also and South American countries in 2005. The study focuses on [inaudible] country negotiation. It was signed in June, 2003, by 10 Latin American countries, the so-called Indian countries and also Argentina, Mexico and Paraguay and Uruguay. The objective of the negotiation was to improve access, that was the overall objective, and for that, the price negotiation [inaudible] reduce prices and also improve the quality of pharmaceuticals. It was coordinated by the Indian community and technical support was provided by WHO [inaudible] the Pan-American [inaudible] Organization and also by [inaudible].

The study we did focused in two specific objectives. The first one was to evaluation the negotiation impact on the prices paid by the public sector, the public [inaudible] of the countries that participated in the negotiation. And we also wanted to identify factors that make it difficult for countries to purchase antiretrovirals at the negotiated prices and quality standards.

[Inaudible] the most important were the ministers of health have provided most of the data we used in this study. We collected data for domestic [inaudible] and also foreign genetic companies and we did a comparison of both actual and the negotiated prices. For this comparison, we did [inaudible] weighted price. That is, the expenditures of negotiated prices divided by the actual expenditures.

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In the chart, we see a price comparison of the average weighted prices in the year 2000 in seven public health programs in the Indian countries. As you see here, the negotiation prices are actually the index and at index 100. See, for example, the case of Peru, with social security in Peru that is [inaudible] some index in comparison [inaudible] negotiated prices of 462. That means Peru has [inaudible] pay 4.6 times more than in case of the prices used in the negotiation [inaudible] were the one used for the purchases. The average for the seven [inaudible] was 165. That is 65-percent more than was paid because the prices negotiated were not used in the purchase of the public products in those countries.

We also identified different challenges that were barriers to get all the possible value out of the negotiations. [inaudible] regulation of policy, we identified that the conditions of the negotiation were not compatible with national regulations in a number of issues, including [inaudible] property, drug registration, differential [inaudible] GNP [inaudible] by equivalence and procurement and also international trade.

The market competition in the negotiation was very limited. There were eight companies that signed the final agreement. Of those, seven were generic companies and one was a [inaudible] company. The domestic companies did not participate in the negotiation. The main reason was because these companies did not meet the agreements, the standards, the quality standards. In the other side, the original companies did not participate in general. These companies asked to

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base prices of the negotiation on purchasing volume and also on purchasing power or human development indexes. The ministers of the countries participating in negotiations didn't want to have such a requirement. Therefore, most of the [inaudible] companies did not participate in the negotiation.

Similarly, issues related with the procurement system. First, the negotiation resulted in a voluntary agreement. Therefore, it was not possible, direct purchasing for participating companies, because the regulation of different countries did not allow for such a thing. Therefore, new domestic bidding processes were created and were made and they were not coordinated. It was a lack of coordination with the procurement processes of the different public programs. We saw, for example, in the case of Peru were three different public forums have three different prices and also they have three different quality standards. Then after the negotiation the countries bought with different prices and also with different quality and by equivalency standards.

Some opportunities that can be extracted out of the price negotiations, the first one is that this type of negotiations can include leverage in negotiations with industry, particularly for small countries. The negotiations also in chorus competition in the market and may improve quality and also reduce prices. And there is also the value of the improved transparency in both in the quality and also in the prices of the pharmaceutical companies.

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Important also is the fact that the different countries can show expertise in chemical resources, not just the countries [inaudible] but also it's possible this transfer between countries and most international organizations.

A few policy recommendations related with the application of these price negotiations. The first one is the need for coordination in regulations and policies of the different participating countries. The second one is having a negotiation of prices and technical specifications that result in actual contractual obligations. For example, using international competitive bidding in a way that the countries can always buy the [inaudible] at the negotiated prices and quality standards.

Also ,it's important to coordinate the procurement of the countries and also the procurement of the national public health care problems in a way we don't have the dispersion we saw in different countries.

A few acknowledgements and to Indian countries ministries of health, international organizations, the percentages of patients living with AIDS and representing international companies, the Indian community and the study that was founded by WHO. Negotiating antiretroviral prices and the use of price negotiation, we should remember this is one of tools we have to negotiate prices. In the study we identified five opportunities and also challenges and we have to work very hard to get the best and maximize the value of the price negotiations. Thank you very much.

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**ANTONIETA LARA:** I want to take four minutes for questions.

**DAVID GRUEY:** Hi. I'm back again. Sorry. Look, just one philosophical comment. There has to be a tradeoff and companies like Merck have to be responsible in terms of pricing, but also we have to make sure we understand the rules and responsibilities of all players in this game because the incentive is needed to invest in the [inaudible] and discovery development, affordable pricing is needed for access to all and we have to take into consideration different countries' ability to pay, commitment, et cetera. And that also goes toward the issue of patents.

One thing that I thought was interesting to note is in the negotiations, and I was present there in Peru when it took place, that the ministers [inaudible] said one price fits all. That's sort of in contradiction to what Constance mentioned earlier about the policy recommendation Brazil has stated, which I agree with [inaudible] which is differential pricing, which I think makes sense based on different countries' ability to pay as well as the burden of the disease. And it was interesting to note [inaudible] was at the negotiations and yet you're talking about the fact that there was one price.

But my question to you is this is a conference on time to deliver and there's certainly been a lot of requests for pharmaceutical companies, resource-based, to deliver new medicines and to make affordable pricing. Who's delivered in [inaudible] negotiations? In other words, of the seven "generic" companies that

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were there, how many of them actually provided medicines and was it at the same prices that they had said they would and what is the situation today in those countries? What percentage of the population is being treated by generic manufacturers as compared to at the time, what's the percentage increase compared to, for example, original-based [inaudible]? So, time to deliver. Who has delivered at what price from those companies?

**ENRIQUE VAZQUEZ, Ph.D.:** It's always a difficult balance between the industry and the health of the population, but in my opinion, we should choose first the health of the population. [Inaudible] the access by now in those countries, I think negotiation achieved lower prices for the countries and it has increased the access in the countries. Therefore, per se, I think negotiation had the value, [Inaudible]

**DAVID GRUEY:** I'm sorry, that's not answering my question directly. There were certain prices that were negotiated at the setting. You gave statistics on them that the generic companies committed to. What are the prices actually today compared to those prices negotiated? How many are actually delivering today? Those are the two questions.

**ENRIQUE VAZQUEZ, Ph.D.:** Well, the data that we have is for 2004 and [inaudible] And in 2004 there was reduction [inaudible] in comparison with the prices that were being paid in that moment by [inaudible]. This is the information we have.

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**DAVID GRUEY:** The data you provided is a price in which the company said they would deliver. My question is have they delivered? At what price and how many of them are actually in the market in the countries?

**ENRIQUE VAZQUEZ, Ph.D.:** Well, one of the basic problems that the negotiation had was that the negotiation was a voluntary agreement. Therefore, the different countries didn't proceed to buy directly [inaudible] of the prices and the quality that was negotiated, therefore a new process was done with participation [inaudible] And the prices as we saw in the results in both cases were higher in general than the prices set by the price negotiation.

**DAVID GRUEY:** How many of those seven –

**ANTONIETA LARA:** I'm sorry, you [inaudible] to ask our presenter after the meeting so we could have other questions –

**DAVID GRUEY:** [Interposing] a public forum, it's very important to know what the results are. Seven companies –

**ANTONIETA LARA:** It seems that [interposing] –

**DAVID GRUEY:** What price did they provided and how many of them are supplying it now? How many are actually – had to be withdrawn for the quality issues? You have to provide the data, not on just the negotiation at the time of the negotiation, but the results. Let's be transparent as well.

**ENRIQUE VAZQUEZ, Ph.D.:** Okay, first the data is completely transparent. This, all this, will be published in a few months and I'd be happy to provide you all the data.

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**ANTONIETA LARA:** Okay. The question for microphone one?

**FEMALE SPEAKER 1:** Can you hear me? Okay. This is really very, very interesting and I'm [Inaudible] from Johns Hopkins. I have two questions. One, just on the type of details you collected, you said it was Ministry of Health data. Could you just a little bit expand on the quality and the type of data that you collected? And secondly, when you talked about the challenges to negotiation, you said that the originator companies did consider the human [inaudible] index and purchasing power of the host, the other countries where the drugs would be used. I'm quite curious as to why the government, you said that some governments opposed that. That was sort of a challenge. I was quite curious to find out why. Because in principle and theory, you know, that seems to be the right way to go.

**ENRIQUE VAZQUEZ, Ph.D.:** Yeah. In starting with your last question, I think the opinion of the ministers of health was to have the same prices for all the countries participating in the negotiation. And it was something that was decided by the ministers that in a way that benefits to the small countries that participated in the negotiation. I think it was the main objective to get a single price, a single quality for all the countries that participated in the negotiation.

[Inaudible] the question of the data, the data we collected per se the explanation of all the data will take a lot of time, but we collected the prices in different ways. At the end, we collected prices based on actual price paid by the public programs. That

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includes all the costs attached to those types of prices. I'd be happy to give you the information, specifically how we collected, how we gleaned the data, how we guaranteed that all the data was fine.

**ANTONIETA LARA:** [Inaudible]

**FEMALE SPEAKER 2:** [Inaudible] regarding differential pricing. I mean, it's an interesting tool to [inaudible] access. However, it's much dependant on the pharmaceutical companies. So, governments can, it's not necessarily sustainable, it's like donations, you cannot guarantee it's going to be like that forever. So governments do have to get together and to promote other means of procuring access.

**ANTONIETA LARA:** Last question.

**DEAN STUTCHER [misspelled?]:** My name's Dean Stutcher from the Global Fund. I have a question regarding that when you realize that the exit prices compared to the negotiated prices was 1.65 in average and all the way up to 4 or 5, something. What was the key reason for that apart from coordination between the different level countries?

**ENRIQUE VAZQUEZ, Ph.D.:** Well, the main reason was that the type of negotiations, the first negation was [inaudible] negotiation with all the [inaudible] countries participating. Therefore, I've said the volume should be much higher in that case. Then, [inaudible] did individual negotiations or contracts [inaudible] processes that were very much more smaller and with very different conditions. Also signing of the contracts, like the case of Peru,

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they have some conditions in the contracts that require some preferences to domestic companies. It was around a 25 percent increase in price that could be true to these types of factors. Overall, I think that the condition of the negotiations were very good to [inaudible] the most value in the reduction of prices and also in quality. And the individual negotiations of bidding processes [inaudible] each country didn't have that possibility.

**ANTONIETA LARA:** Last comment [inaudible].

**MALE SPEAKER 3:** We have a friend from Merck and it seems [inaudible] company has used with differential pricing argument is a misuse of his argument from the point of view of economics. Because what the differential pricing arguments says is that it's normal for a company to make prices according to elasticity of demand to price. And so, in the north, the elasticity of demand to price of course is lower than in the south.

So you have an opportunity to charge higher prices and it's a way for that, to some extent, [inaudible] in the north to pay more for the drugs and gives the possibility to amortize the fixed cost of R and D. And then you get a marginal cost in the southern country. When you use the differential pricing argument in order to try to have different prices between countries because there are slight differences in their GDP, it's a way to use that as a political manipulation to reduce the [inaudible] bargaining power of these countries.

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So it's really a misuse of the argument from the point of view economic [inaudible] and in practice and that's what we try to do.

**ANTONIETA LARA:** Excellent.

**ENRIQUE VAZQUEZ, Ph.D.:** [Inaudible] that wasn't a question for me. Thank you.

**ANTONIETA LARA:** Thank you very much. Our next presentation is aimed [inaudible] "The Impact of Antiretroviral Therapy on Employment Outcomes of HIV-Infected Individuals and Their Families: Evidence from Rural Western Kenya." By Dr. Harsha Thirumurthy, who is an economist and [inaudible] at the Center for Global Development in Washington, D.C.

**DR. HARSHA THIRUMURTHY:** Thanks for the introduction and thanks everyone for coming to the session. I'm going to be talking today about the impact of ARV therapy on the employment outcomes within families in Western Kenya. This work is based on a paper I've written with Marcus Tholstein [misspelled?] at the World Bank and Joshua Graff [Inaudible] at Columbia University.

Now, the motivation for this research project really stems from the fact that donor support for various health interventions often depends on expectations or beliefs about the costs and benefits of these competing interventions. However, to do these cost benefit evaluations and calculations, the proper measurement of benefits, particularly the economic benefits is really critical.

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If you consider the case of ARVs for example, we know that ARV treatment is currently available to less than 20-percent of the people who need it in developing countries and there's indeed some discussion of the fact that these are relatively inexpensive health interventions compared to others that are out there. But we also know that ARV treatment results in dramatic improvements in health status and moreover a wide range of economic benefits may also be possible precisely because of the dramatic improvement in health status.

And so this research project, while not focusing on all of the economic benefits that may result from treatment, is going to take a very careful look at the immediate benefits, the immediate economic benefits to patients and their family members. And more broadly understanding something about these economic benefits may help us also understand whether ARV treatment alone can mitigate some of the very far-reaching economic consequences of HIV/AIDS or if we may, for example, need other interventions to be implemented along with ARV treatment.

So to estimate this type of economic impact of ARV treatment, we conducted a household survey in western Kenya. This survey was done in collaboration with a treatment program known as [Inaudible], which is the result of collaboration between the Indiana University School of Medicine and Moore University in western Kenya. [Inaudible] is currently providing HIV care for over 30,000 HIV positive patients at one urban site and 14 rural sites across western

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Kenya. Many of these patients are also receiving antiretroviral treatment. The study that I'm going to be presenting data from today was conducted in villages surrounding one of those rural health sites, known as the [Inaudible] Rural Health Center. [Inaudible] first rural HIV clinic and because it's a very resource poor setting, almost all of the eligible patients at this clinic are treated for free. And most of the households in the survey area and the [inaudible] of this clinic are engaged in subsistence farming.

I'll talk about the study design in more detail, but to sum it up essentially, this is a longitudinal study and it was designed so that we could measure the causal effect of ARV treatment on economic outcomes.

Just briefly, let me tell you about the sample. There are basically two samples of households in the study. The first is a sample of 191 households in which there is an HIV positive adult who is receiving ARV treatment. I should say that because this is in a rural site where treatment has really become available only since 2003, many of the patients receiving treatment start with very low CD4 counts, often below 100. And we are going to take advantage of the variation in the baseline CD4 count when I show you the analysis, the results in a few minutes. The second sample of households in the study, which is also important for the empirical work is a sample of 503 households, which are chosen randomly from a census that was done in the [Inaudible] area of this health center.

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The primary reason for having this random sample of households is that it serves as a useful control group for basically secular trends in the outcomes that we are interested in. For example, in a rural setting, weather-related movements and outcomes such as children's schooling or even employment outcomes is going to be very important. And it's important to control for that when we look at changes in these outcomes over time.

So the longitudinal study basically refers to the fact that there were two interviews that were conducted six months apart beginning in 2004 and the second round of interviews with these households was conducted in 2005. So as I said, the primary data that we're using in the study come from a household survey. The household survey was conducted at the homes of many of the patients as well as the random sample households. Typically, we would interview the household head as well as the spouse and these were long interviews that were done.

Unfortunately for the respondents, it took about two to three hours to complete these interviews, but the advantage of having these long questionnaires is we were able to get a comprehensive measure of living standards in these families. So everything from the employment outcomes of the patients we were interested in, but also employment outcomes for children in those families, as well as outcomes such as schooling and nutritional status of children living with the patients.

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So the main reason for focusing not just on the index patient but also on people living with those patients is that we have to recognize that children, in particular, are likely to play a big role in the household's decision making processes. Particularly when, say, a patient gets sick or in the case of ARV treatment, gets better in health status.

So, let me just quickly go over what we found in the baseline survey round which is round one of the survey. Keep in mind that many of the ARV recipients in round one were beginning ARV treatment but some of them were already on the ARV treatment for about three months or so. So what you can see here is that the patient populations predominantly female, which is quite common in many rural treatment sites in Africa compared to the random sample, where 49 percent of the adults are female.

When you focus on the employment outcomes of these adults, the questionnaires asked precisely about activities that these adults were engaged in the past week, in the week prior to the interview. And these activities I should emphasize included work that was done on the farms of these households as well so this is not like an urban setting or say, a setting in the U.S., where you have adults that are, say, employed for a salary. So this encompasses both labor that's done for a wage., as well as salaried jobs, as well as work done on farms.

So if you look at the fraction of adults that reported doing no work in the past week, it's much higher, significantly

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higher in the ARV sample we have 24 percent of the adults saying they did no work. And you find a very similar pattern in the total number of hours worked so we very carefully went over the actual number of hours that these adults spent on each of these activities.

So, this should be a figure that's actually very familiar to people, particularly clinicians. It shows you what happens to the CD4 count of the adults in our sample that are receiving the ARV treatment. You can see that there's this very dramatic increase in the CD4 count very soon after treatment is initiated and this is of course the well known clinical benefit to treatment that has been documented in the literature.

Turning to the results from our own survey, what's really striking about this graph is that it shows you what happens to the fraction of adults that report doing any work, i.e., that are participating in the labor force. And you see that the response to treatment is actually very similar to what you've observed for the cd4 count and this is indeed a big part of the story here showing you that there's a rapid improvement in employment outcomes for the patients.

Now as I said, when you do this in regressions with the inclusion of individual [inaudible] facts and controls for all of the secular trends that I mentioned, you find a very similar effect basically a 20-percent increase in the labor force participation rate and a 34-percent increase in hours worked. And these employment increases occur primarily in the first three to six months after

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treatment is initiated and after that they tend to be smaller. And at the beginning I mentioned that a big part of the study was intended to focus on people other than the patients and when you look at what happens to employment of children, so incidence of child labor in these households we find that when you look at boys in particular, they're working significantly less once treatment is initiated for the adult.

Okay, and we find a decrease of about eight hours per week for boys in these households. It's a significant, it is a substantial decline when you consider that children in these households are typically working about 15 hours a week and so a decrease of eight hours is highly significant. We don't find this for girls but what we think is happening for girls is actually that the activities that they're involved in typically tend to be within the household doing chores such as collection of firewood or household or other activities in the household and that's something that did not get measured in the survey so we're not able to pick up any changes in that type of activity.

And then briefly, let me also just say that while I've talked about employment outcomes of patients and children up to now, the survey also had a lot of data on school attendance of children and what we collected here is very similar to labor supply and in particular we asked about the number of hours the children spent in school in the past week. And what we find when you look at this outcome for children, is there's actually a significant increase in

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school attendance. School attendance goes up by about seven hours per week. It's a 22-percent increase relative to the three treatment levels for the adults.

And so this is really sort of underscoring the point that the benefits of providing ARV treatment go well beyond the patient. And that if we're looking only at clinical outcomes of patients or if we're looking only at the employment outcomes of patients we're missing a big part of the story. And so talked about some of the [inaudible].

Let me just conclude here by talking about the more broader implications of these results. First, it's telling us that the health improvements due to ARVs are accompanied by very rapid economic recovery, which is reassuring given what we know about clinical outcomes and how those respond and secondly these results are providing some concrete evidence that treating adults today provides some significant benefits as well to future generations so when you look at outcomes such as children's education and nutrition and find those improving that suggested these may have some very long-term benefits for families.

For the purpose of evaluating health interventions or even ARV treatment interventions in particular, this is really making the point that it's important for us to look beyond the health benefits of treatment and include a lot of these other economic benefits so we can really make good decisions if we're going to take evaluation of programs seriously. So, as I said this paper is written jointly with

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Marcus and Josh and it's available online for those that may be interested in looking at it. Thanks a lot.

**ANTONIETA LARA:** A couple of questions?

**PHIL MCGREAVEY[misspelled?]:** Phil McGreavey. You seem to be on the road towards benefits verses cost. Did you get there and what are the results?

**HARSHA THIRUMURTHY:** Yeah. So I skipped over one slide, which talks about basically a rough calculation of what the increase in employment for the patient alone is worth. So if you take average daily wage rates in the survey area, so there is a casual labor market and it's possible to impute a wage for labor supply, we find that just the increase in employment for the patient is worth about \$325 per year per patient. Okay?

Now that does not include the education in child labor for these households, so that's going to have an economic cost in the sense that the children are not earning as much anymore, but one would expect that these families actually value the time of children in school much more highly than say the value of time of children doing activities at home.

So just that sort of rough calculation of the economic benefits from employment alone amount to about \$325, which actually sort of compares quite well to the sort of estimates you see of the treatment costs. And I'd emphasize that that's just really one of the benefits we're picking up and it doesn't include the health

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benefits that first and foremost the biggest I think ten percent here.

**ANTONEITA LARA:** Next question.

**SUSAN CARTER:** Susan Carter from the United States. Just a quick question on the issues of education and nutrition, some of those other family benefits. Can you separate out any differences between boys and girls? Do you have the gender, is it similar for girls and boys there which sort of underlines your other presumption if it is, I guess?

**HARSHA THIRUMURTHY:** That's right. So, as I mentioned, before and we looked at market labor done by children we found that boys were actually seeing a benefit by having to work less, but girls were actually not experiencing any change. But when you look at school attendance, what we find is that there actually increases in school attendance that are realized by both boys as well as girls and the increases for both of those groups are highly significant and very similar. So the increase is about seven hours. Those apply to both boys and girls. So that's a reassuring result that suggests that it's not, these benefits are not being realized disproportionately by the boys in these households.

**ANTONEITA LARA:** Thank you very much. Our last presentation is "Funding HIV Prevention in Developing Countries: Equity vs. Efficiency" by Dr. Arielle Lasry. She has been conducting the session [inaudible] in sub-Saharan Africa in the department of

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[inaudible] in the University of Toronto. Arielle has a [inaudible] and is now a fellow of the U.S. Center for Disease Control.

**DR. ARIELLE LASRY:** Thank you. And good morning, everyone. By contrast to the previous talks, I will be talking about prevention. So this presentation is entitled, "Funding HIV Prevention in Developing Countries: Equity vs. Efficiency." I'd like to acknowledge my co-authors, Greg Zerrick [misspelled?] of the University of Western Ontario and Mike Carter of the University of Toronto. As well, I acknowledge my main source of funding, the Ontario HIV Treatment Network.

In terms of the introduction from 1996 to 2003, global HIV funding increased tenfold. From 300 million to three billion, but the estimated need was 6.3 billion. So despite considerable progress in funding, it still falls way short of the needs. The table below illustrates this, the projected AIDS funding gap in low and middle-income countries is estimated at 20 billion U.S. dollars between 2005 and 2007. So what I'm trying to get at is that given the large funding gap, attention should be brought to the manner in which resources are allocated.

Resource allocation is the process of distributing funds or resources among programs, populations or regions that are competing for the same budget. Funds tend to traverse several levels in distribution before reaching their intended program of use. So for example, a provincial health authority may allocate its budget to regional authorities who, in turn, allocate to their subregions, et

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cetera. And the process iterates until the funds are spent on an actual program or an intervention. For example, a hospital purchases a CD4 count machine or society runs an HIV awareness campaign. An important point here is that at each of these levels, a decision is made as to how the resources should be allocated. And this research focuses on the decision-making process for resource allocation or the way that funds are allocated.

There are several types of rational or formal models that can be used to allocate HIV and AIDS resources and such models are very valuable because they can be used to maximize the use of resources and narrow the gap between the funding needs and the availabilities.

In the study I considered two allocation approaches. First, efficiency, which I defined using an optimization model that aims to minimize the total number of new infections. Optimization can be classified as a rational economic approach to resource allocation. So to operations researchers and health budget planners, optimal is the best outcome, but I should add that optimal decisions can be unpopular if they're perceived to be unfair or inequitable, which leads us to the next approach, equity. And here I define equity as an allocation that is proportional to the number of HIV cases in a particular population. Equity is perceived as an important value representing fairness and social justice. And it's also very simple to apply.

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In terms of the objective in this study, I addressed two main research questions and they are what is the impact of using an efficiency verses an equity based approach for allocating HIV prevention resources in developing countries and which level in the decision making process should be optimized? I consider a problem consisting of two levels of allocation. First, a global body allocates to two regions, region one and region two. And second, each region in turn allocates to two subpopulations, a high-risk subpopulation and a low risk subpopulation. In the lower level of allocation, the region must also decide on the amounts to allocate towards reducing unsafe sexual contact and reducing mother to child transmission.

So given two levels of distribution, upper and lower, I define four solution methods combining all possibilities as equity and optimal allocation approaches. An optimal here is the efficiency approach. So of the four possible options, the optimal allocation at both the upper level and the lower level will yield the best possible outcome and the all equity option should yield the worst possible results so the objective is to evaluate whether an optimal allocation at the upper level yields a better outcome than an optimal allocation at the lowered level.

Now in terms of the methods, beginning with the efficiency allocation approach, the problem can be defined using two components that interact with each other. A, an epidemic model, which determines the epidemic model by the epidemic outcome given a defined

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allocation of resources. B, the optimization model, which uses analgarhythm [misspelled?] to generate different allocation scenarios then it tests them on the epidemic model until it reaches the best outcome. So, for the epidemic model I use a four-compartment model for each of the subpopulations. And the subpopulations were region one high risk, region one low risk, region two high risk, region two low risk. The subpopulations are divided by infection state and maturity level. So compartment S is the adults that are susceptible to HIV infection. Compartment I are the adults that are infected with HIV. U are the children that are uninfected and not mature enough to be susceptible, they're not old enough to be susceptible. And children in U are either born to HIV negative moms or born to HIV positive moms but MTCT was successfully prevented. In compartment V, the children are infected by MTCT and they're presumably not mature enough to transmit the infection.

In terms of the movement to and from each compartment, the deltas are the death rates that remove people from the compartment. Beta are the birth rates and they add to the children compartments. M is the rate of mother-to-child transmission and of children born to mothers in I, M determines how many children will be born to U and how many children would be born to V, the infected children compartment.

[Inaudible] is the effective contact rate. An effective contact is a sexual interaction that results in the infection of a susceptible individual by an infected individual, so [inaudible] will

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determine the number of new infections in adults. Now the total number of new infections which is what we're looking to minimize is the sum of new infections in I and new infections in V. The infections in I are determined by [inaudible], the effective contact rate. And infections in V are determined by M, the rate of MTCT.

The allocation model is expressed as follows. This is a typical formulation for an optimization model. The objective function aims to minimize the sum of new infections in each subpopulation subject to a total budget constraint. And practically, this is achieved by reducing the transmission rates, [inaudible] and M, which are a function of how much is allocated to reducing those rates. Now in the equity approach, the total budget is simply allocated equitably to regions 1 and regions 2 based on disease prevalence in the region. In turn, the budget for each region will be allocated proportionately based on adult and child disease prevalence within the subpopulations. And so the equity model here is not concerned with disease progression, new infections, transmission rates or epidemic models. The goal here is equity, not efficiency.

In terms of the results, I ran the base case through the four solution methods, which were optimal at both levels, equity at both levels, equity at the upper level and optimal at the lower level and optimal at the upper level and equity at the lower level. And I found that optimal is the method that minimizes the total number of new infections with 2.3 million in some new infections. Equity ranks

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last. Equity optimal ranks second and optimal equity ranks third with a total of 2.5 million new infections.

Now, the gap between the best and the worst solution method is an 8-percent increase in the number of new infection. However, I'd like to point out that between the first and the second solution method we changed the upper level of allocation type and get less than one percent benefit. Also, between the third and fourth solution method, we changed the upper level and again get minor benefits. So these results suggest that the lower level allocation is of greater consequence in terms of minimizing the number of new infections than the upper level. And this is quite contrary to the presumption that it's most important to get things right at the top or at the upper level.

In conclusion, I performed sensitivity analysis on many variables. And though the gap between the best and worst solution method did vary, the ranking of the four options was maintained as per the baseline case. And over 250 sensitivity analysis scenarios were evaluated in the interest of time I'm not presenting those details, but I'd be happy to provide them to those who are interested. Again, in all the variations carried out dominance of the equity optimal option over the optimal equity option was upheld. And consistently, the widest gap is by far between the equity optimal and the optimal equity option.

This study demonstrates that resource allocation methods for HIV prevention have a strong influence on the overall outcome of

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the disease and that serious consideration should be given to the lower levels of decision-making.

Now, what are the implications for decision makers in government, public health agencies and NGOs who allocate HIV funding? The first is that efficiency approaches may narrow the gap between HIV funding needs and the available resources. Knowledge of lower level data is crucial and resource allocation decisions at the level of local governments will bear an important impact on the outcome of the disease. And lastly, more resources are required to curtail this epidemic but more importantly, we need to make a more efficient use of the existing resources. Thank you.

**ANTONEITA LARA:** Any questions? I would like to thank all of the people that attend the session and the presenters. Thank you very much.

[END RECORDING]