

Tools for Resource Allocation among Enhanced Comprehensive HIV Prevention Plans (ECHPP) Interventions

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National HIV Prevention Conference
August 14-17, 2011

National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention
Division of HIV/AIDS Prevention



The title of the presentation is “Tools for Resource Allocation among ECHPP Interventions”.

Disclaimer: all data shown in the slides is for illustration purposes only, and does not represent any actual jurisdiction.

Outline

- Background
- Objective
- Resource allocation tools with illustrative examples
 - Tool A: Priority setting tool
 - Tool B: Resource allocation model
- Discussion

This is the outline of my presentation:

- First, a brief overview of the background and objective.
- Then we will introduce two tools that we developed to facilitate resource allocation, with hypothetical examples to illustrate how to use these tools.
- Lastly, we will discuss the strength and weakness of these tools.

Background

- ECHPP funded jurisdictions differ in their
 - Technical capacity for mathematical modeling and economic evaluation of HIV interventions
 - Access to data on resource utilization, cost and efficacy of interventions, risk populations, transmission dynamics and other data required by economic-based allocation tools

ECHPP grantees are required to identify the optimal combination of 14 required and 10 recommended interventions that will prevent the most number of new infections. The grantees are required to justify their HIV budget allocations and demonstrate how these decisions affect their local epidemic.

The funded jurisdictions differ in terms of their technical capacity and access to data, including programmatic data on the costs and effectiveness of prevention interventions in their jurisdictions and HIV epidemic data from their communities.

Objective

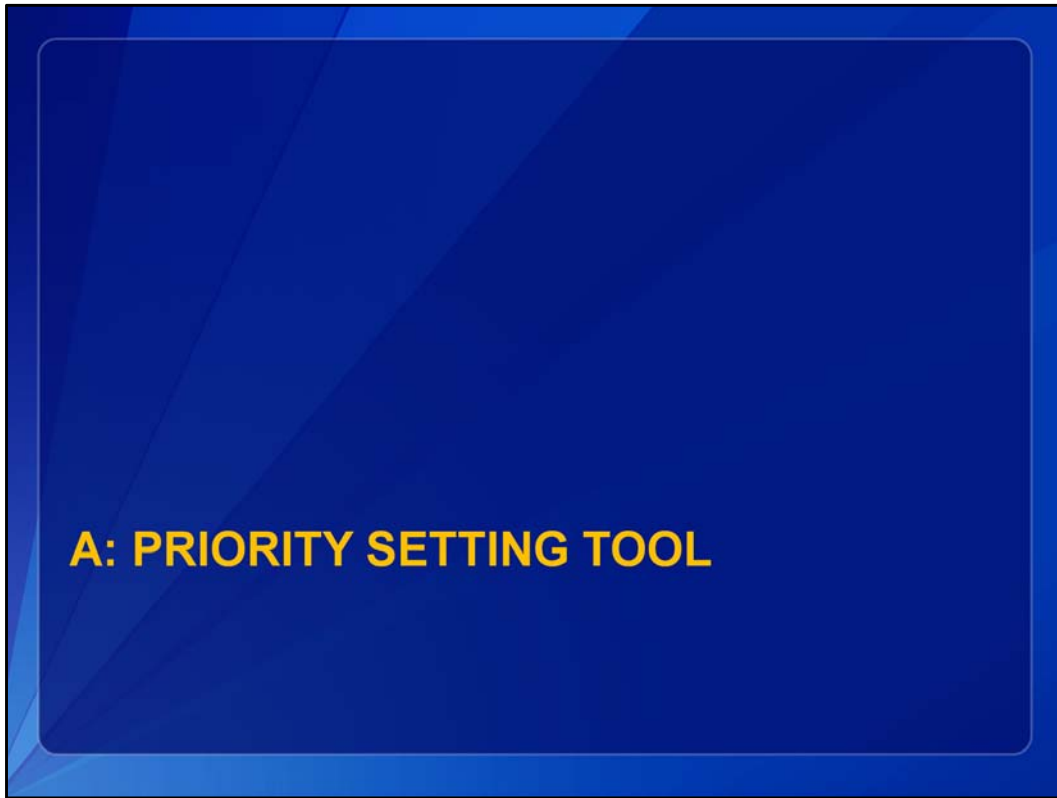
- To develop tools for local health departments to help with efficient resource allocation for HIV prevention

We developed two tools that differ in their input data requirements and level of complexity.

Resource Allocation Tools

- Tool A: Priority setting tool
 - Step 1: Set priority level for each intervention based on strength of evidence on efficacy, cost-effectiveness and other considerations
 - Step 2: Determine budget requirement for each intervention based on funding gap to reach desired penetration rate
- Tool B: Resource allocation model:
 - To identify the optimal combination of interventions that prevents the most new HIV infections over one-year planning horizon, based on jurisdiction's HIV epidemic

- Tool A, the priority setting tool, provides a process to prioritize each intervention. In Step 1, decision makers work through several questions to help them determine the priority of each intervention. In Step 2, decision makers establish the budget for each intervention.
- Another tool we developed is a mathematical model that identifies the optimal combination of interventions to prevent the most new infections in a particular jurisdiction. It is a one-year epidemic model with an optimization component.



Let's first take a look at the priority setting tool.

Snapshot: Priority Setting Tool

A GOAL SETTING GUIDE FOR REQUIRED/RECOMMENDED INTERVENTIONS

Last updated: 11/23/2010

This guide is provided to support the decision making process for prioritizing the interventions in your Enhanced Comprehensive HIV Prevention Planning and Implementation (ECHPP) plan. Your ECHPP plan should make measurable progress toward the attainment of NHAS/DHAP targets.

Instructions

Step 1: Use the process flow in [Figure 1](#) to determine the priority level of expanding each intervention.

- 1.1 Are you considering expanding intervention X? Begin by filling in [Table 2](#) and consult [column \[i\]](#).
 - If yes, go to Step 1.2.
 - If no, assign a priority level of "None" to this intervention in [Table 2, column \[j\]](#) and end the flow. Provide a justification, evaluate the funds expected to be released from this reduction and include them in the available budget.
- 1.2 Do you expect this intervention to be effective towards meeting the NHAS/DHAP targets?
 - If yes, go to Step 1.3.
 - If no, assign a priority level of "None" to this intervention in [Table 2, column \[j\]](#) and end the flow.
- 1.3 Determine priority level of expanding intervention X (**High, Medium, Low**). You may consult the list of considerations in [Table 1](#) and alter it as needed.

Note: The list in [Table 1](#) is provided as a suggestion only; it should be tailored to reflect your jurisdiction's needs.
- 1.4 Is there evidence supporting the cost-effectiveness of this intervention? Refer to [Tables 3](#) and [4](#) and the Appendix as needed.
 - If yes, report the priority level established in step 1.3 to [Table 2, column \[j\]](#) and end the flow.
 - If no, downgrade the priority level established in step 1.4 by one level and report it to [Table 2, column \[j\]](#) and end the flow.
- 1.5 Repeat **Step 1** for all interventions and move to **Step 2** when done.

Step 2: Consult [Table 2](#), select the interventions in order of their assigned priority level and tally the additional funds required for each intervention. When your selection, stop when the total additional funds required exceed the additional funds available for these interventions.

The tool includes step-by-step instructions; a process flowchart for priority setting, and a summary table that helps grantees establish funding requirements.

The document is called "A Goal Setting Guide for Required/Recommended Interventions" and it was disseminated to all ECHPP grantees last year.

**Illustrative Example:
Step 1: Priority setting for testing in clinical settings**

Considerations	Yes	No
Does strong scientific evidence exist that this intervention is effective towards meeting NHAS targets?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Does this intervention have the potential to identify the desired number of unaware PLWHA compared with alternative strategies?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Is it feasible to expand this intervention?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Can you expand the intervention to the desired penetration rate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Is there evidence supporting the cost-effectiveness of this intervention?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Priority level: <input checked="" type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> None: Maintain or reduce the investment in this intervention		

We will give an hypothetical example to illustrate how this tool can be used to assign a priority for testing in clinical settings. This is just an example, individual health departments may determine a different priority.

We came up with a list of factors to consider. These include evidence of effectiveness, feasibility, scalability, and cost-effectiveness. The list of considerations can be modified to reflect additional considerations in specific health departments.

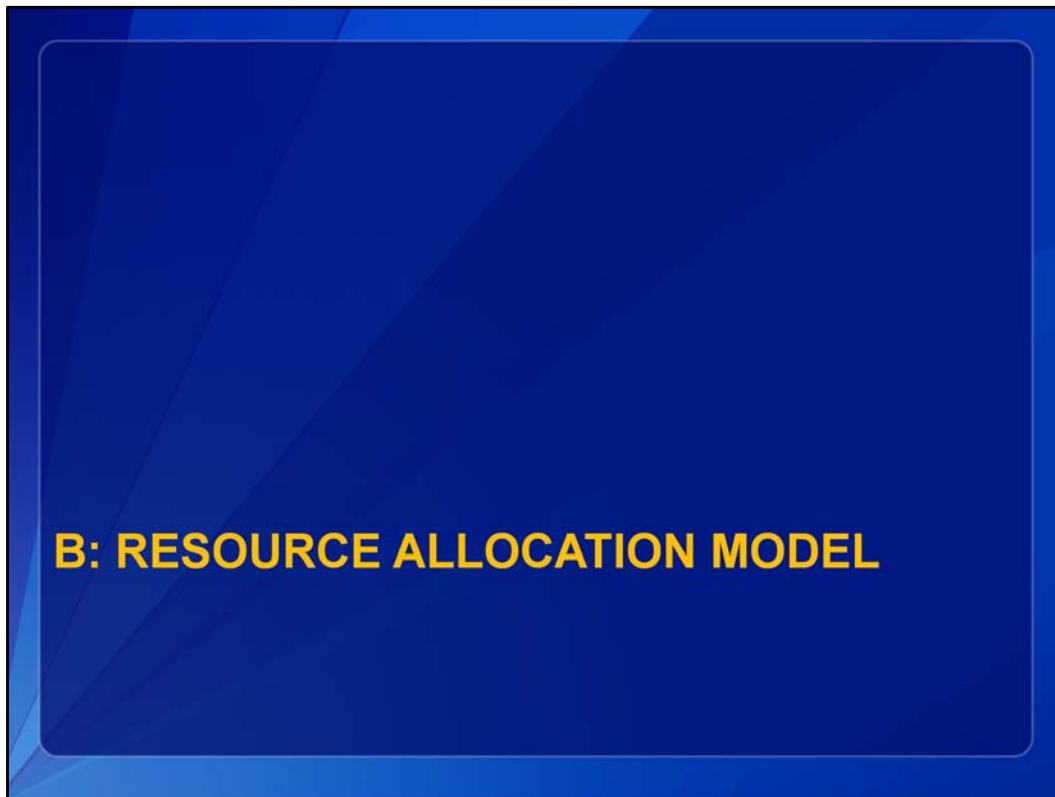
We answer all these questions in this example as Yes, and we gave testing in clinical setting a high priority.

Illustrative Example: Step 2: Establish funding requirement for testing in clinical setting			
	Measure	Estimation/Calculation	Example
[a]	Current budget	Current annual budget	750,000
[b]	Number of persons served	Program data	10,000
[c]	Budget per person	$[c]=[a]/[b]$	75
[d]	Maximum capacity	Estimated maximum number of people that can be served, assuming no resource constraints	100,000
[e]	Penetration rate	$[e]=[b]/[d]$	10%
[f]	Desired penetration rate	Consensus among key stakeholders	15%
[g]	Gap in penetration rate	$[g]=[f]-[e]$	5%
[g']	Additional people served	$[g']=[g]*[d]$	5,000
[h]	Other funding identified	Additional funds beyond [a]	125,000
[i]	Additional funding required	$[i]=[c]*[g']-[h]$	250,000 $=75*5,000 - 125,000$

Once we assign the priority level, we determine by how much budget we would like to expand this intervention and how much the expansion would cost.

- Assume in 2009 we had \$750 thousand for testing in clinical settings and we tested 10 thousand people. We put the budget in item [a] and the number of people served in [b]. Then item [c] the budget per person served is equal to 750,000 divided by 10,000, equal to \$75.
- Assume there is no resource constrained in our hypothetical jurisdiction, we could perform 100,000 tests. We put 100,000 in item [d].
- Then the current penetration rate is equal to 10,000 divided by 100,000, which is equal to 10%.
- As we would like to expand testing, we set the target penetration rate to 15%. The decision makers can use consensus among experts or key stakeholders to determine this rate.
- The gap in penetration rate, item [g], is equal to 15%-10%=5%, that is, we would like to test 5,000 more people next year.
- We had identified that other than the current \$750 thousand we had, we would receive \$125 thousand more for testing next year. Then we can calculate the additional amount we need to reach our desired penetration rate. The additional funding required is equal to (the budget per person) * (Maximum capacity) * (Gap in penetration rate) – Other funding identified.
- Again, the decision makers need to go through this calculation for all selected interventions and then tally the additional funding requirements according to the priority they set for each intervention.

To summarize, the priority setting tool provides a structural mechanism to facilitate priority setting and to document the rationale of how the decision is made. This tool requires moderate amount of data, such as budget, service level, and size of target population.



B: RESOURCE ALLOCATION MODEL

For jurisdictions that have sufficient data and technical capability of mathematical modeling, they can also use mathematical model to inform their resource allocation decisions.

Methods

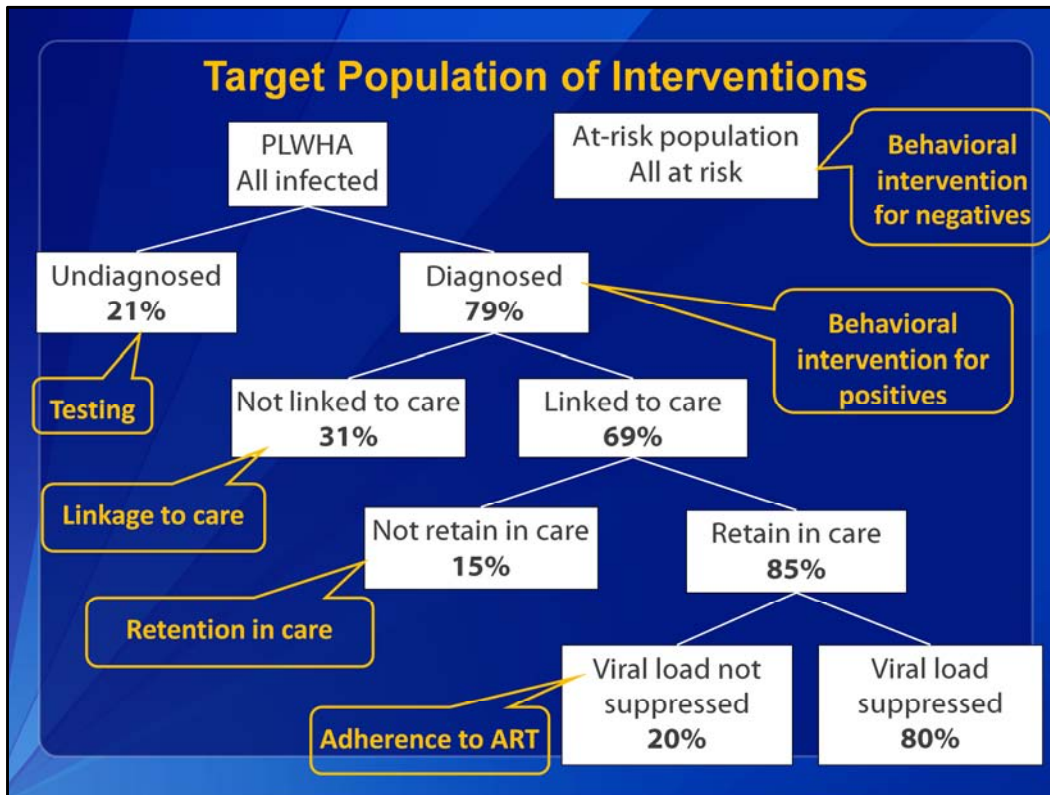
- To develop a mathematical model to identify the optimal combination of interventions that prevent the most new infections based on jurisdiction's HIV epidemic
- Annual HIV prevention budget allocation model:
 - One-period epidemic model with optimization component
 - Selected interventions:
 - Testing
 - Partner services
 - Linkage to care
 - Retention in care
 - Adherence to HAART
 - Behavioral interventions for positives
 - Behavioral intervention for negatives
 - Inputs: cost, target population, efficacy, maximum % of target population reachable, total budget

We developed a mathematical model to determine the annual allocation of an HIV prevention budget that prevents the most infections.

The model is a one-period epidemic model with an optimization component. It determines the allocation to specific interventions based on cost-effectiveness.

We considered a subset of interventions for which there are reasonably robust data on costs and effectiveness, including testing, partner services, linkage to care, retention to care, adherence to ART, and behavioral interventions.

Among the data required for the model are programmatic data on costs and efficacy in reducing HIV transmission, epidemic data on risk populations, and jurisdiction-specific data on the HIV prevention budget and the proportion of each risk population that can be reached by specific intervention.



This chart illustrates the target population for each intervention.

As you can see, some interventions apply to many people, for example, everybody at-risk for HIV is eligible for behavioral intervention for negatives. Whereas, adherence to ART only applies to the diagnosed positives who are linked and retained in care, and who are insufficiently adherent to treatment to achieve viral load suppression (corresponding to $79\% \times 69\% \times 85\% \times 20\% = 9\%$ of PLWHAs)

Illustrative Example: Sample of inputs to resource allocation model

Intervention	Annual cost per effective outcome: 2009\$	Efficacy: Reduction in transmission	Duration of effect	Max % of target population reachable
Testing in clinical	5,000 Cost per new diagnosis	0.0903	Assume 5-years	10%
Testing in non-clinical	11,073 Cost per new diagnosis	0.0903		10%
Partner services	15,768 Cost per new diagnosis	0.0903		5%
Linkage to care	4,377 Cost per additional person linked	0.0572	Assume 1- year	20%
Retention in care	4,377 Cost per additional person retained	0.0673		20%
Adherence to HAART	3,650 Cost per additional person adhere	0.0841		20%
Behavioral intervention for HIV+	514 Cost per client served	0.0141		20%
Behavioral intervention for HIV-	322 Cost per client served	0.0006		10%

This table provides a sample of inputs that go directly into the resource allocation model.

The key inputs include cost for each key outcome in the 2nd column, efficacy in terms of annual HIV transmission reduction in the 3rd, the duration of the effect in the 4th, and the maximum % of target population reachable in the 5th.

These data could change from health department to health department.

Illustrative Example: Result: budget allocation

Intervention	Budget (\$ in million)	Nb. of infections averted
Testing in clinical	2.7	52
Testing in non-clinical	5.9	52
Partner services	4.2	26
Linkage to care	2.5	32
Retention in care	1.8	28
Adherence to HAART	1.7	40
Behavioral intervention for HIV+	1.1	30
Behavioral intervention for HIV-	-	0
Total	20	260

Using the hypothetical inputs shown in the previous slide, we run the model to determine its suggested allocation of \$20 million in prevention funds and corresponding number of infections prevented.

Under the assumptions of this hypothetical case, allocating the \$20 million in this way is expected to prevent the most number of new infections.

Illustrative Example: Result: budget allocation

Intervention	Optimal allocation		Equal allocation	
	Budget (\$ in million)	Nb. of infections averted	Budget (\$ in million)	Nb. of infections averted
Testing in clinical	2.7	52	2.5	48
Testing in non-clinical	5.9	52	2.5	22
Partner services	4.2	26	2.5	15
Linkage to care	2.5	32	2.5	33
Retention in care	1.8	28	2.5	28
Adherence to HAART	1.7	40	2.5	40
Behavioral intervention for HIV+	1.1	30	2.5	30
Behavioral intervention for HIV-	-	0	2.5	5
Total	20	260	20	221

To compare the optimal allocation with a different approach, this table shows the number of infections that would be prevented if the \$20 million were distributed evenly among the interventions. Here the expected number of infections prevented is 221 or 15% less than under the model's suggested optimal allocation.

Discussion: Priority Setting Tool

- Provides a framework to facilitate decision making
- Requires moderate amount of data
- Considers qualitative factors that decision makers face
- Allocation decisions are based on priority level
- Does not provide estimates of the number of infections averted
- Results are somewhat subjective

To conclude, the priority setting tool provides a framework to guide resource planning.

This tool requires a moderate amount of data, such as the local budget and an estimate of service level.

It also takes qualitative realities into consideration, such as the feasibility of implementing an particular intervention and its scalability.

The allocation decisions are based on priority level instead of quantitative estimates of intervention impact. Thus, the results may be more subjective.

Discussion: Resource Allocation Model

- Allocation decisions are driven by cost and effectiveness
 - Synthesizes data from many different sources
 - Predicts the impact of an intervention on HIV infections
 - Indicates the optimal allocations of prevention funds among several interventions and populations
- Model should inform conversations between researchers and policy makers
 - Models are based on sometimes uncertain input data, as well as assumptions and expert opinion
 - Consequently, numerical results may not be precise.
 - Rather results suggest where more resources may lead to a larger effect

For the resource allocation model, the decisions are driven by the cost and effectiveness of the considered interventions.

- The model synthesizes data from many different sources, including literature, results of randomized control trial or cohort studies, and sometimes expert's opinions.
- It can predict the impact of an intervention on both cost and HIV infections averted over a certain period of time.
- The result of resource allocation model indicates the best allocation of prevention funds among several interventions and populations.

Note that mathematical models provide simplified version of complex reality and they are based on assumptions and uncertain data.

Therefore, models should be used to inform conversations between researchers and decision makers and we need to be careful in interpret the results of a model.

Acknowledgements

- ECHPP team; Division of HIV/AIDS Prevention, Centers for Disease Control and Prevention
- AIDS Activities Coordinating Office, Philadelphia Department of Public Health
- Prevention Modeling and Economics Team, Division of HIV/AIDS Prevention, Centers for Disease Control and Prevention

Thank you

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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