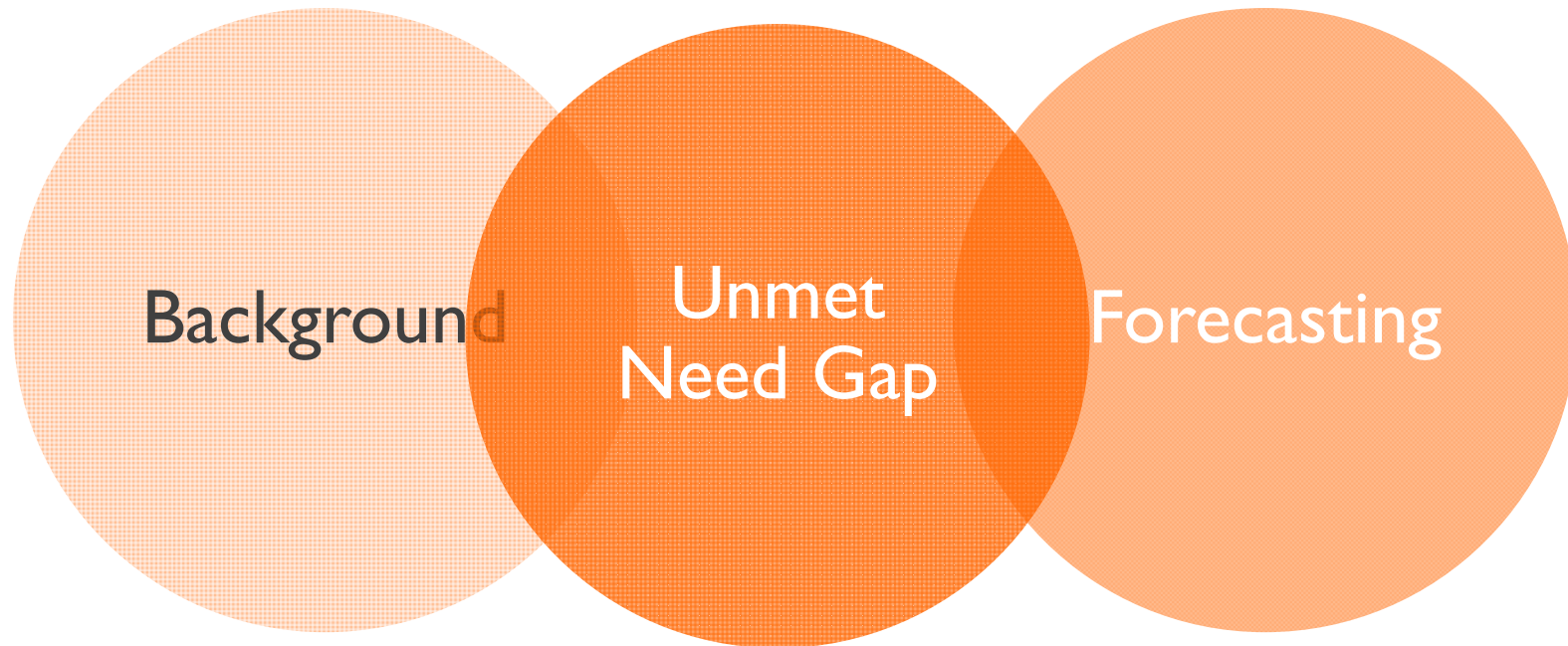


**Forecasting demand, usage,  
and need for new drugs  
(long shelf life)  
Quantifying the unmet need for  
misoprostol within Tanzania**

Yehuda Bassok, Ph.D., Sriram Dasu, Ph.D.,  
Melissa Higbie, MBA, MPH, Olivia Reyes, MPH

# Agenda

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Background

Unmet  
Need Gap

Forecasting



# Why Misoprostol?

- 
- 1 of 13 life-saving commodities prioritized by the *UN Commission on Life-Saving Commodities for Women & Children*
  - Increased availability would contribute to the prevention of:
    - 41m cases of PPH
    - 1.4m maternal deaths over the next 10 years
  - Low cost, long shelf life, heat stable



# Why Forecast ?

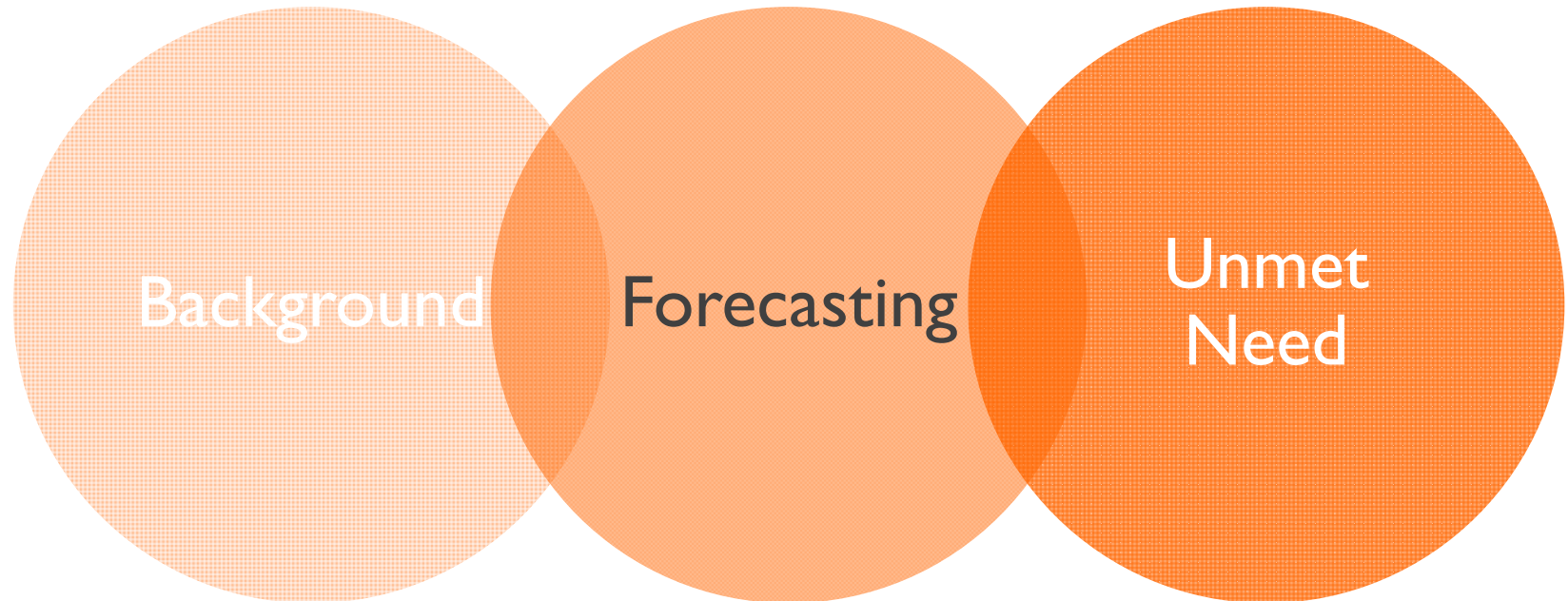
- Enables introduction of new and underused medicines
- Plan and align funding efforts
- Plan educational efforts
- Support manufacturer production & capacity
- Minimize potential for stock outs & wastage

MUMS  
EMPTY  
CARTONS



# Agenda

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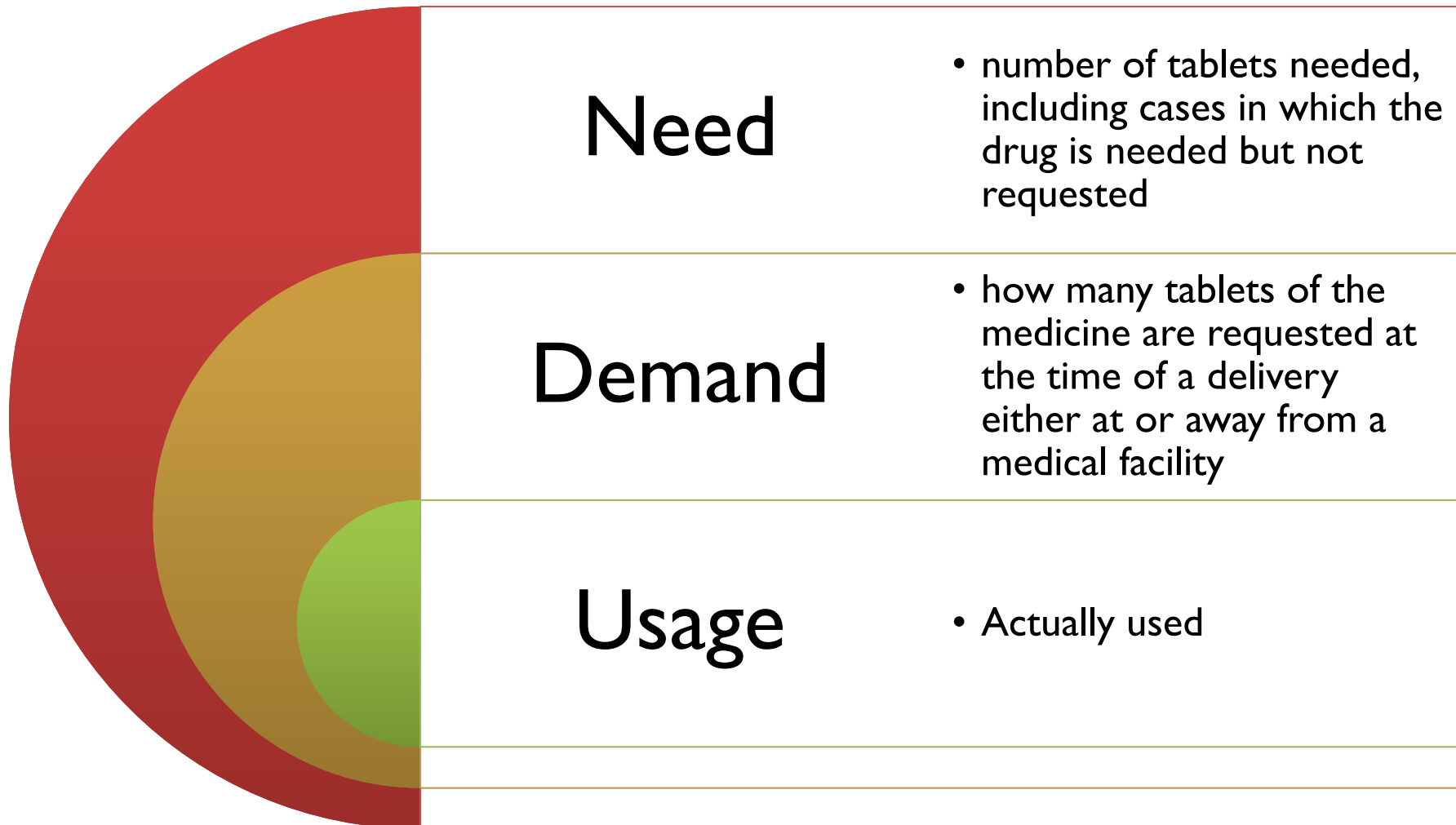


Background

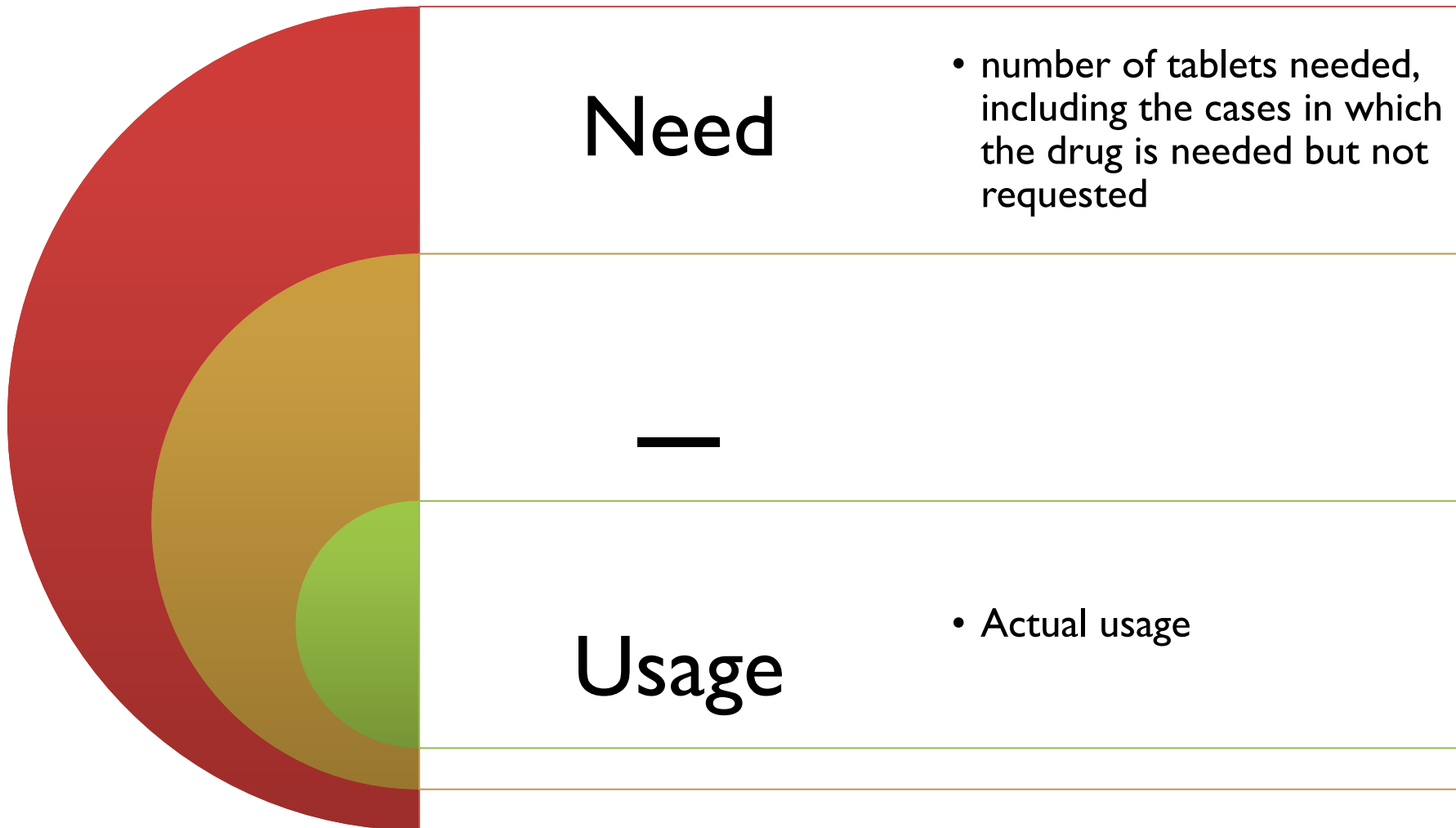
Forecasting

Unmet  
Need

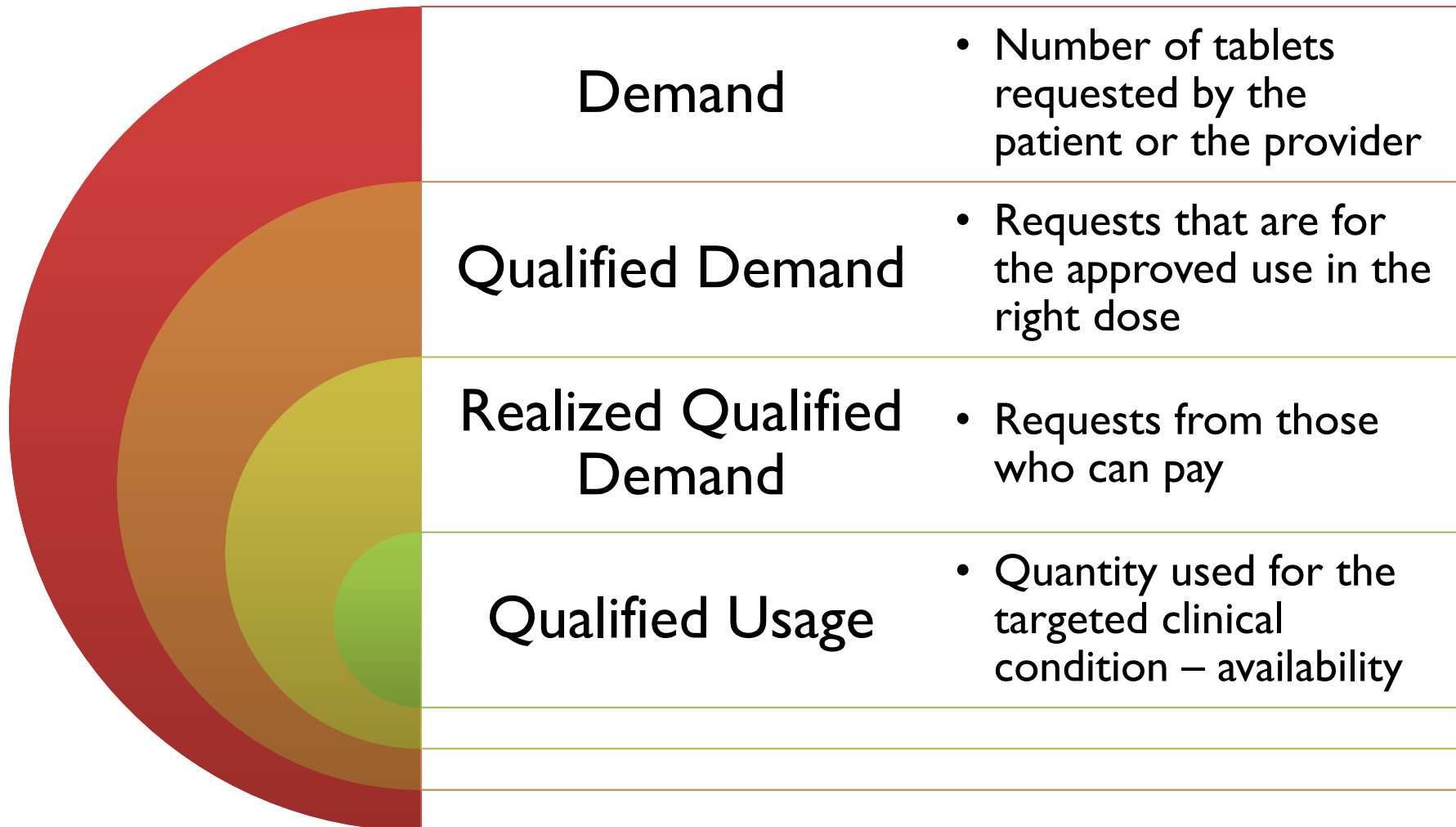
# Some Terminology



# Gap to close: Need – Usage

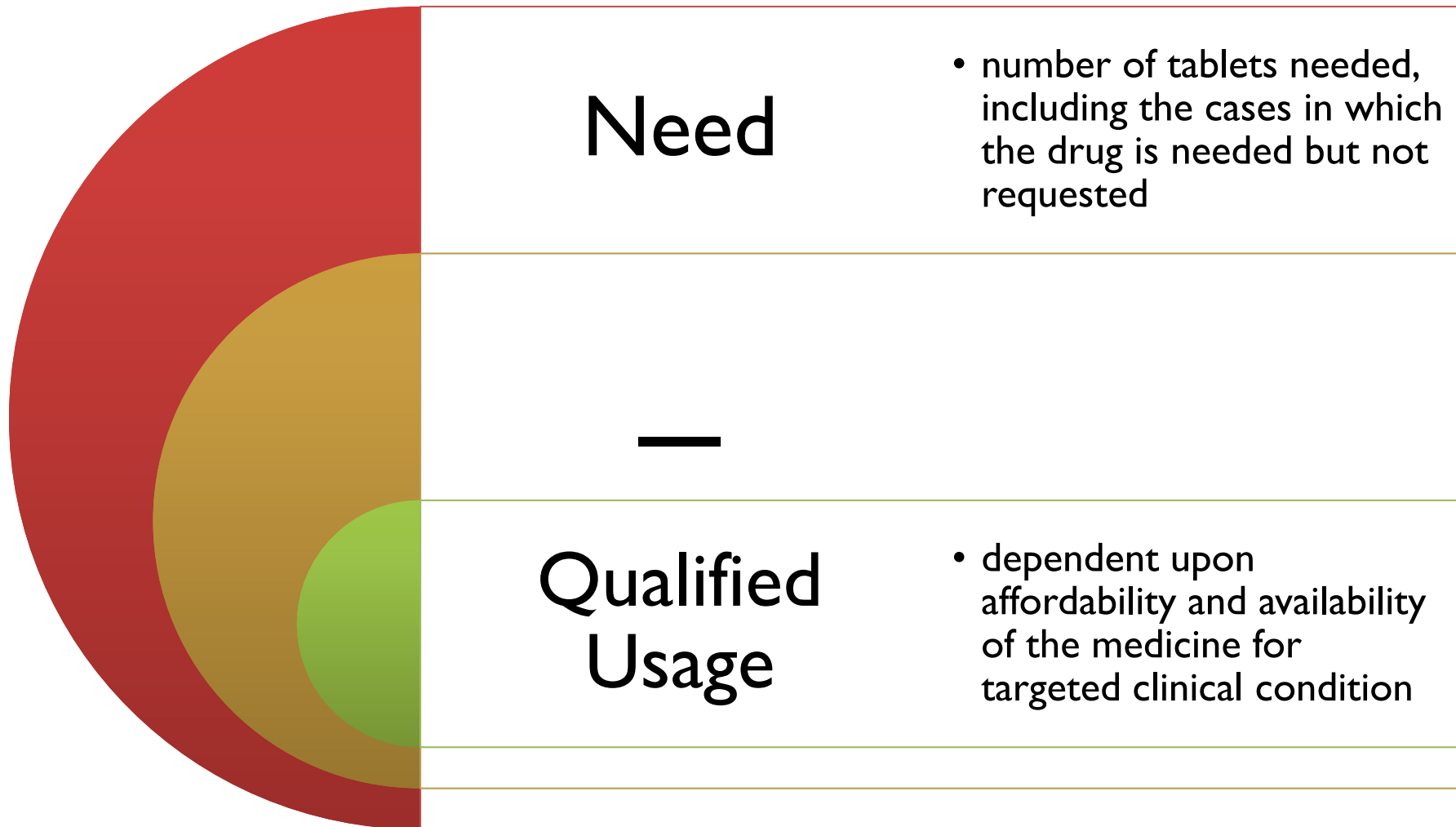


# Some More Terminology





# Gap to close: Need – Qualified Usage



4 As:

Awareness, Acceptability, Affordability, & Availability

Unmet Need Gap :  $\text{Need} - \text{Qualified Usage}$

Awareness Gap + Acceptability Gap:  $\text{Need} - \text{Qualified Demand}$

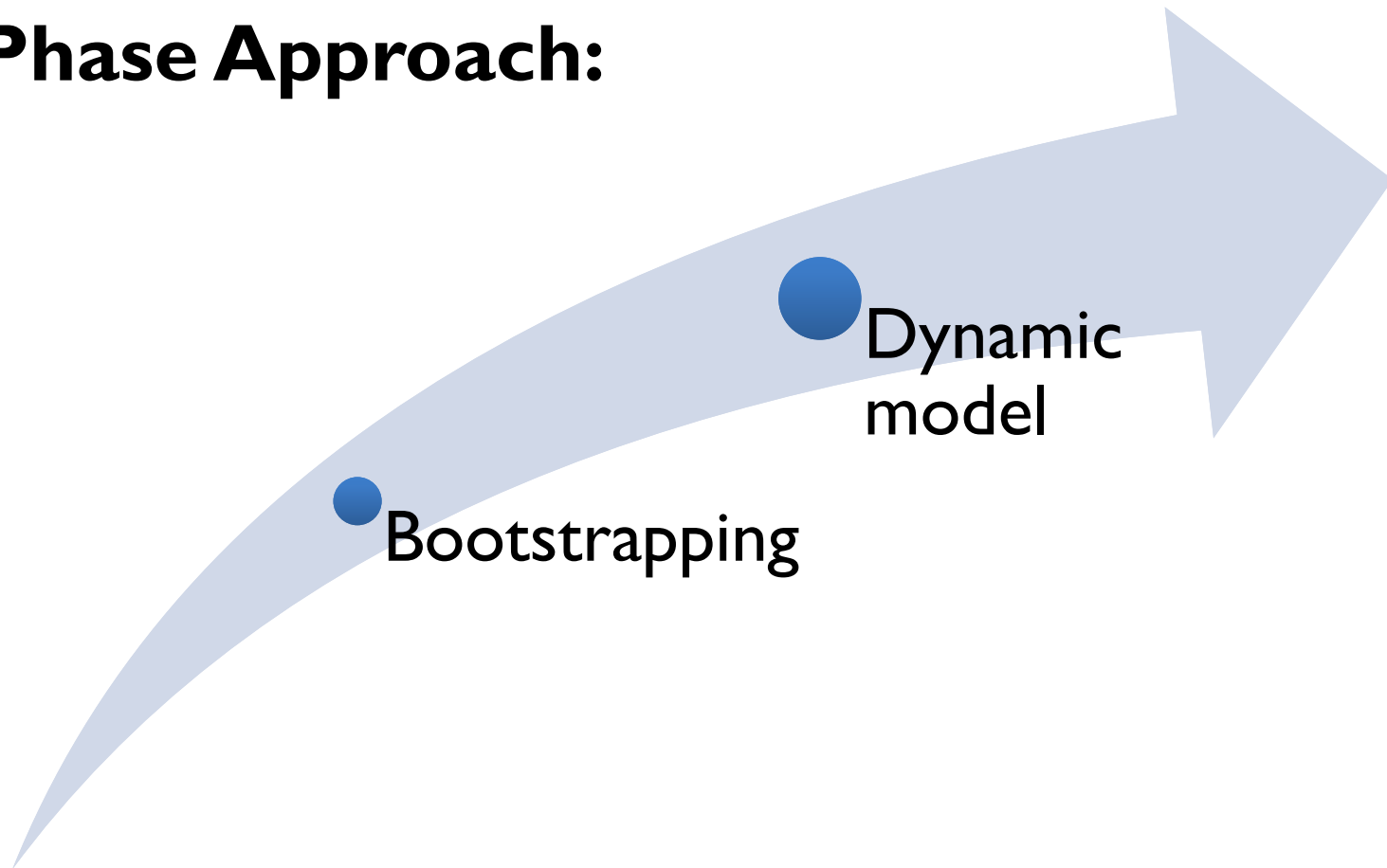
Affordability Gap:  $\text{Qualified Demand} - \text{Realized Qualified Demand}$

Supply Gap:  $\text{Qualified Demand} - \text{Realized Qualified Demand}$

Unmet Need Gap:  
Awareness + Acceptability + Affordability + Supply  
Gaps

# Forecasting Methodology

## 2 Phase Approach:





# Phase I: Boot strapping



- Goal: learn about qualified demand by closing supply gap
- How?
  - Estimate need
  - We know need  $>$  qualified demand
  - Supply at levels close to need
- Isn't this wasteful?
- Yes -- but wastage depends on procurement plans

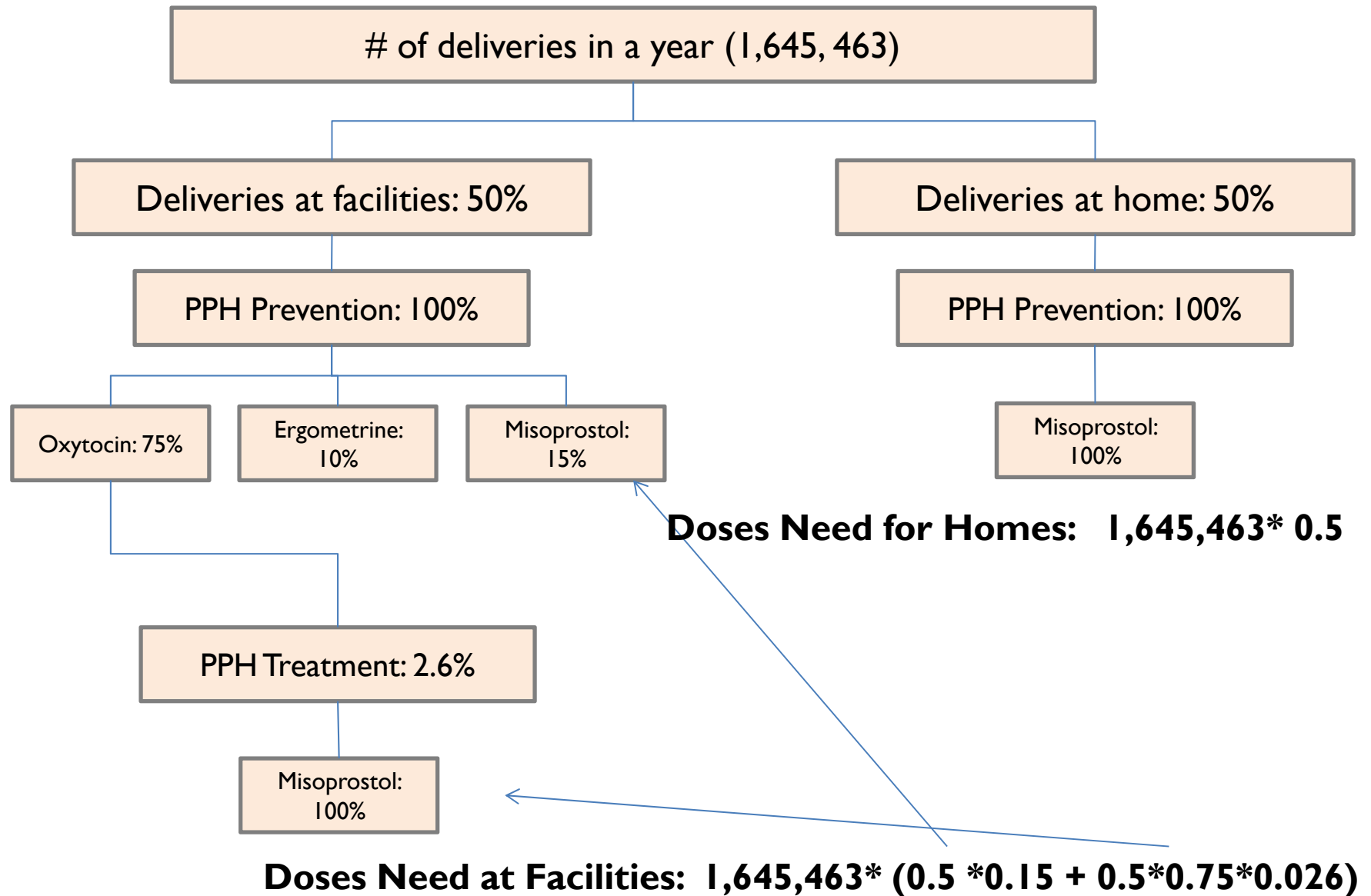
# Estimating Need



- Demographic assumptions
  - Population, birth-rates
- Epidemiological assumptions
  - Abortions, PPH rates, Need for Misoprostol
- Health facility usage assumptions
  - Percentage delivering at home vs facilities

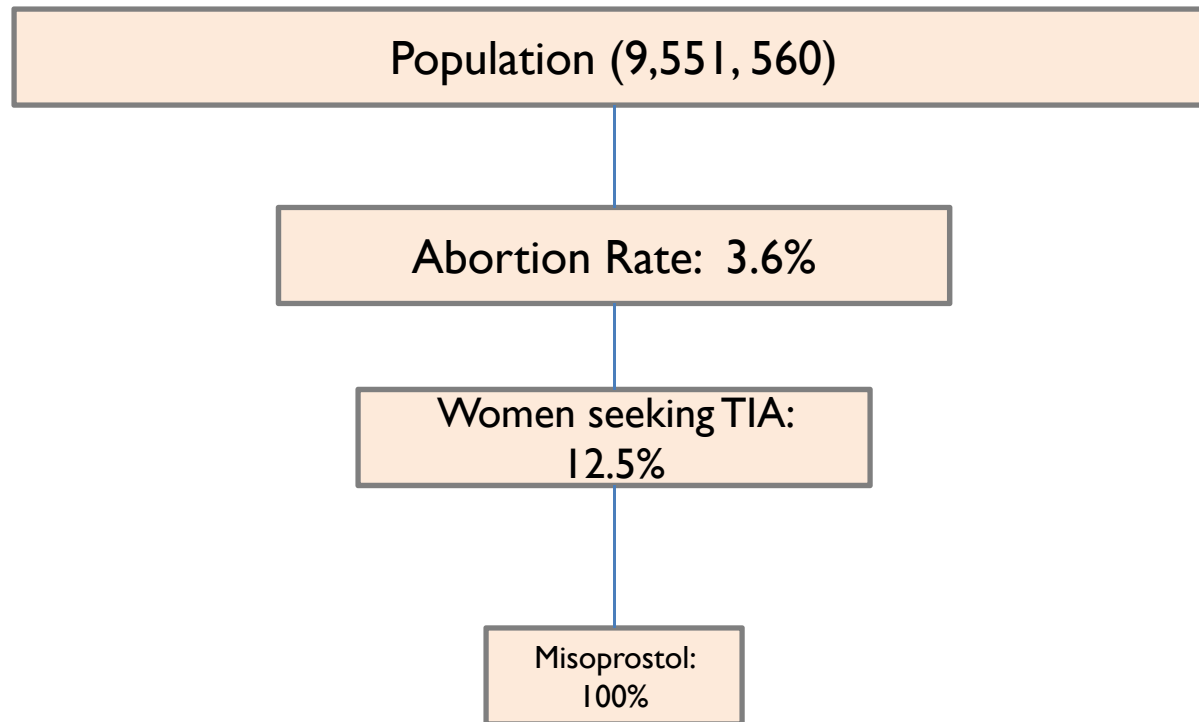
See for example: M. Malik, SAIP & USAID Jan 2013

# Forecasting Tree example: Misoprostol for PPH Management





# Forecasting Tree example: Misoprostol for TIA



**Doses Need for TIA:  $9,551,560 * 0.036 * 0.125$**

# Estimated needs have errors

- Estimated needs will vary from year to year
  - Example US births in 2009: 4,130,665; in 2010 3,999,386
- There are errors in estimated demographic, epidemiological, and usage parameters
  - Example: % that deliver in a facility may not be 50% but 44%, etc
- Can we quantify these errors and thereby the errors in the estimates of needs?

# Measuring the error in parameters

	Average	95% Chance that the Estimate is in this range	
		Lower Bound	Upper Bound
Population of women aged 15 to 44	9,551,560	8,596,404	10,506,716
Number of Deliveries per year	1,645,463	987,278	2,303,648
Abortion Rate	3.60%	0.00%	7.20%
% of Women Seeking TIA	12.50%	0.00%	25.00%
% of Women Delivering in Hospital	50.00%	25.00%	75.00%
% Women receiving oxytocin for PPH prevention	75.00%	50.25%	99.75%
% Women receiving misoprostol for PPH prevention	15.00%	0.00%	30.00%
Estimated incidence of PPH after receiving oxytocin for prevention	2.60%	0.00%	5.20%

## Expert Estimates of Ranges for Parameters

Illustration of the approach – not true estimates



# Measuring the error in needs

Tablets needed per patient for (200 Mg) for:	
TIA	3
Prevention of PPH (in Community)	3
Prevention of PPH Facility (@ Facility)	3
Treatment of PPH (@ Facility)	4

<b>TOTAL TABLETS NEEDED FOR</b>	<b>AVERAGE</b>	<b>STANDARD -DEVIATION</b>
<b>TIA</b>	<b>128,946</b>	<b>99,258</b>
<b>Prevention of PPH ( in Community)</b>	<b>2,468,194</b>	<b>816,511</b>
<b>Prevention of PPH ( @ Facility )</b>	<b>370,229</b>	<b>233,638</b>
<b>Treatment of PPH (@ Facility )</b>	<b>64,173</b>	<b>42,467</b>
<b>SUB TOTAL of Tablets Needed for PPH</b>	<b>2,902,596</b>	<b>904,207</b>
<b>TOTAL TABLETS</b>	<b>3,031,542</b>	<b>909,639</b>

Illustration of the approach – not true estimates

# Procuring based on needs estimate

Measure we propose to use

% of need that is met (fill rate)

Standard Deviation	Procurement	Fill Rate
600,000	3,000,000	93.55%
600,000	3,404,694	97.75%
600,000	3,621,860	98.87%
600,000	3,986,912	99.71%
600,000	4,395,809	99.95%
900,000	3,000,000	91.13%
900,000	3,607,041	96.98%
900,000	3,932,790	98.51%
900,000	4,480,368	99.63%
900,000	5,093,713	99.94%

# Realized Qualified Demand is less than Need

- In our example if the annual procurement is 4,000,000 units then almost surely the qualified demand will be met and the supply gap will be closed
- Caveat:
  - Medicines have to be distributed correctly to each of the demand points
- What about wastage?



# Waste reduction through phased procurement

- Procure annual requirements in 4 shipments
- First shipment little more than  $\frac{1}{4}$  of annual
- Subsequent purchases based on realized qualified demand
  - Shelf life is long (18 months)

# Other challenges in closing supply gap

Procurement Gap :

Proposed Procurement – Actual Procurement

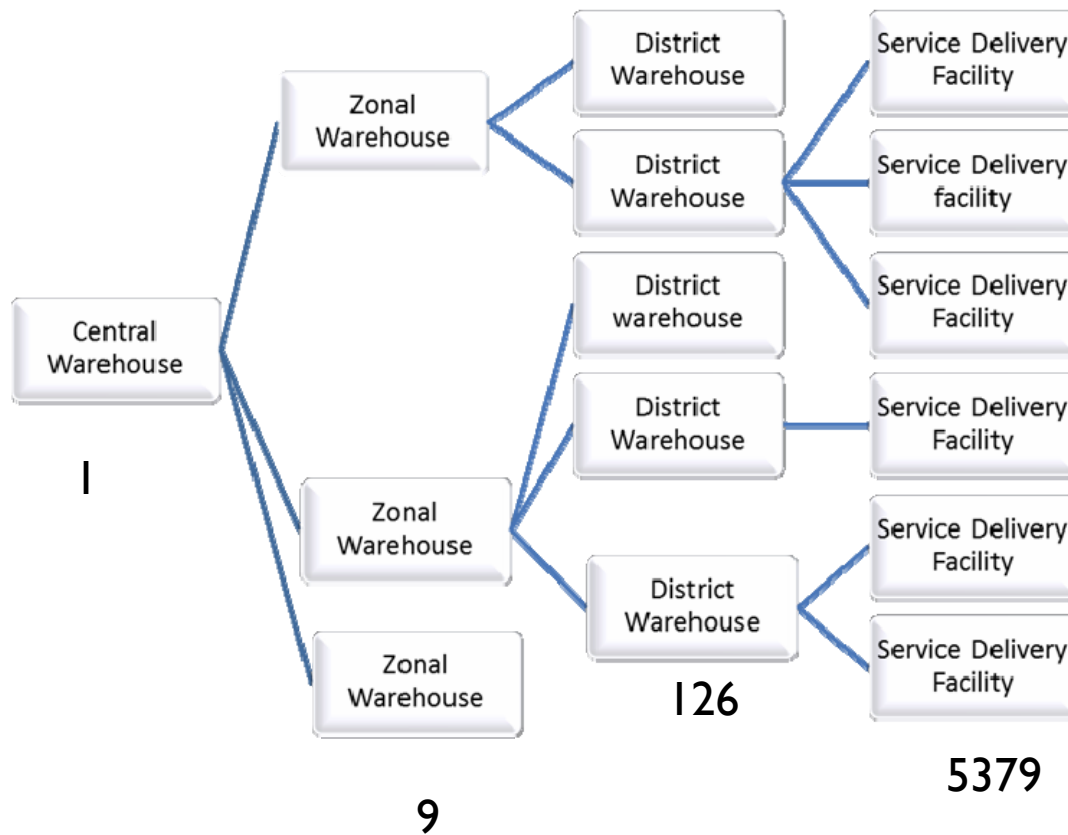
Delivery Gap:

Proposed Delivery – Actual Delivery

Inventory Gap:

Planned Inventory Level – Actual Inventory Level

# Procurement and distribution can cause supply gaps



Frequent Deliveries

Estimate Need at each Node

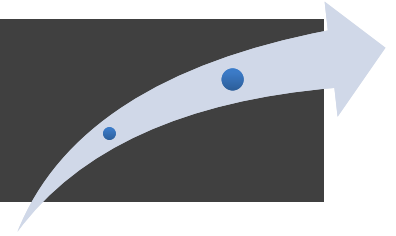
Allocate to ensure same fill rate @ each node

# Benefits of Node Level Data

- Refine assumptions about facility usage and epidemiology at each node
- Analysis of differences in realized demand can shed light on
  - Awareness, acceptability and affordability differences



# Phase II: Dynamic model



- **Modify based on observed data**
  - Realized qualified demand
  - Qualified demand
  - Ordering and issues data
  - Demographic, epidemiological, and usage data
  - Refine demographic data based on income and security of income
- **If supply gap is closed, then can estimate**
  - Awareness + Acceptability + Affordability Gaps
  - Can develop appropriate interventions

# Unmet Need

In 2010, the unmet need for misoprostol in Tanzania was approximately **2.2 million tablets.**



Source: VSI

# Summary

- Estimates of needs and corresponding errors in the estimate can be leveraged to plan procurements for new drugs
- Needs exceed realized demand, hence by basing procurement on needs we can close supply gap (in principle)
- Phased procurement can reduce wastage
- Closing supply gap provides epidemiological, demographic, and usage data that can be used to improve forecasts
- Closing supply gap provides estimates of awareness, acceptability, and affordability gaps.

## Limitations:

- Shelf life and cost of the drugs influence the effectiveness of the proposed approach

Thank you.