



Catchment Area Resource Optimization

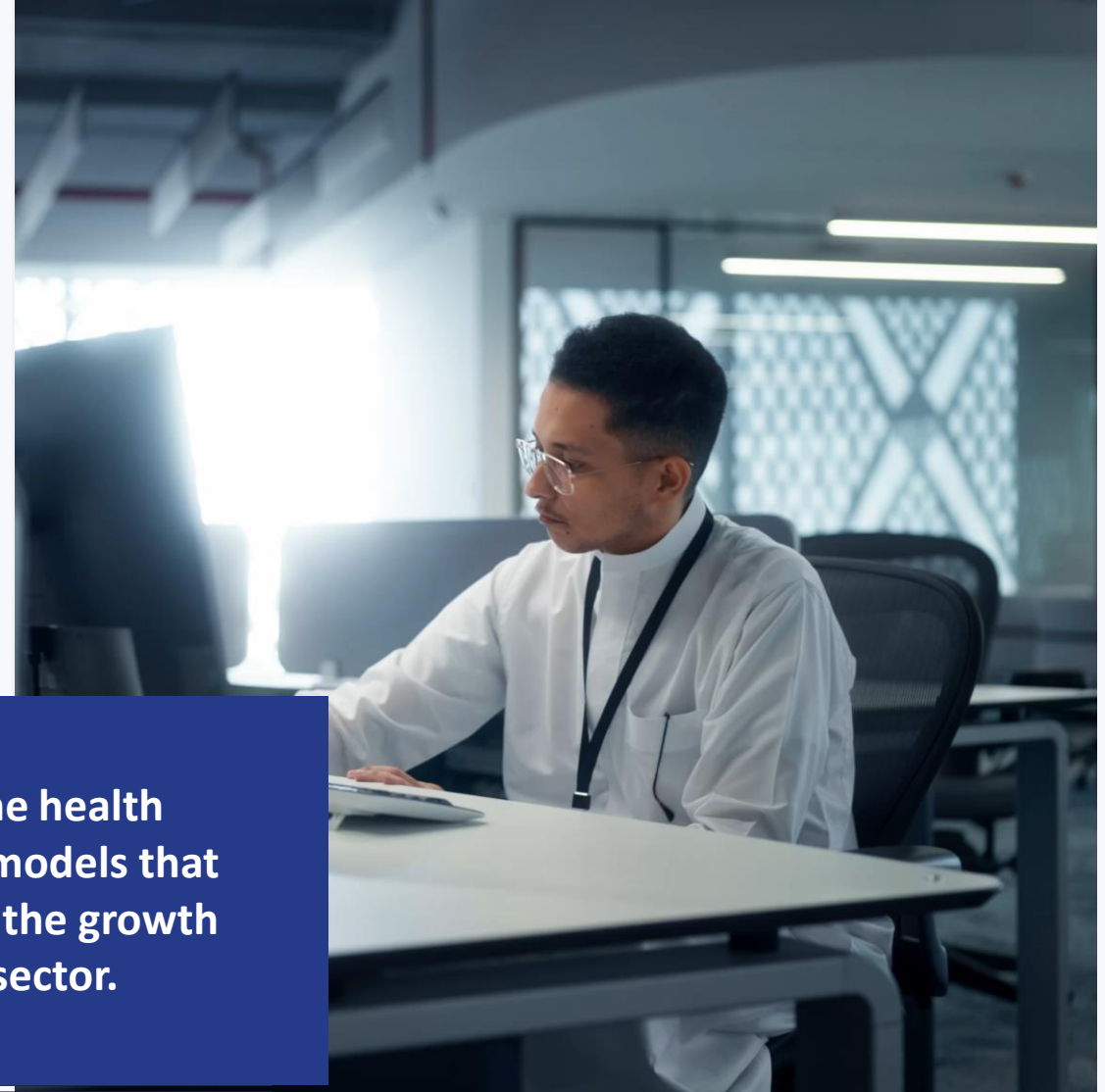
Using Anylogic Simulation To Optimize Primary Healthcare Services



Lean is a leading company in developing and empowering the health sector in Saudi Arabia, through numerous Innovative, data powered, and reliable solutions for a pioneering health ecosystem.

Lean's enthusiasm are drawn from the fact that its objectives lines up with Vision 2030's objectives, aiming to enhance KSA's quality of general health indicators.

Lean works with various entities in the health sector, to build sustainable business models that create an environment that supports the growth and continuous improvement of the sector.





Leading innovation towards
a smart health ecosystem
for a better life

Business Solutions

Health Care

Lean Themes:

Population Health

Ecosystem Integration



Why Catchment Area Resource simulation?

The situation:

Saudi healthcare system is built of clusters; each cluster constitutes of many establishments. However, the location, the service type and capacity are all part of a legacy planning which may not serve the purpose of today and future.

The Complication:

Continuous planning using this approach will lead to congestion/overcrowding and resource wastage, which may affect beneficiary experience.

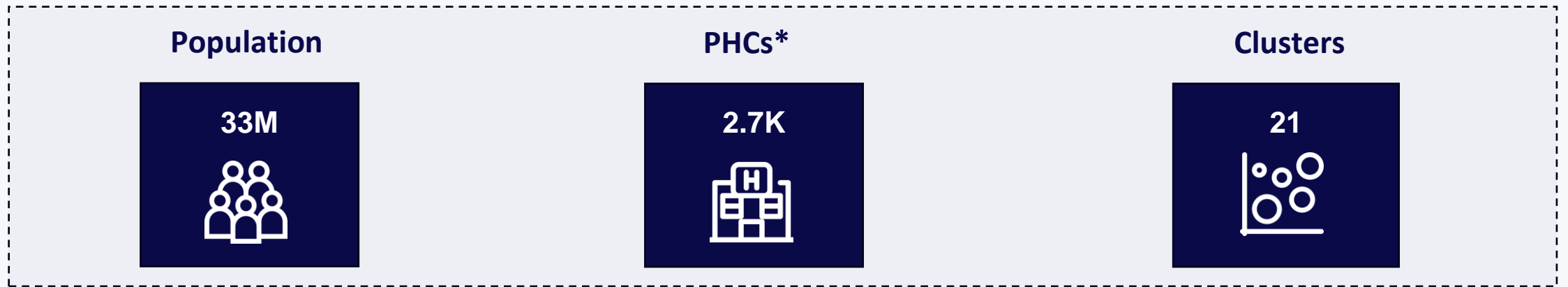
The resolution:

In this work, we present how simulation modeling can help to assign beneficiaries and optimize primary healthcare services on a national level.

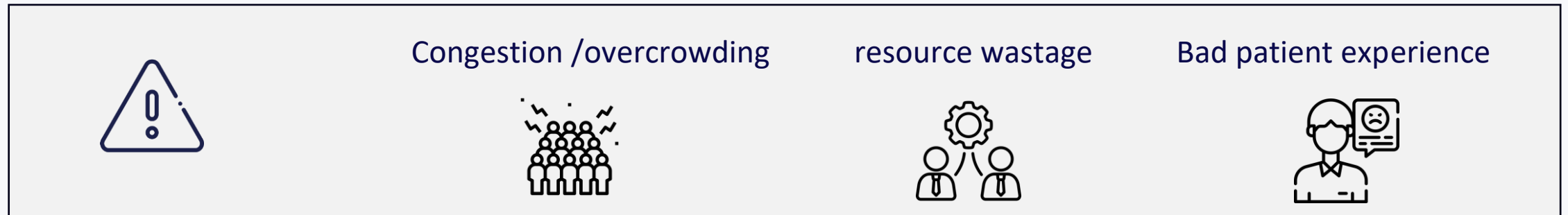


The Clusters Today Operates What Used To Be Ministry Of Health Establishments

Number of population and managed assets



If we did not intervene



*PHC: Primary Healthcare



We Built A Simulation Model on A National Level

Objective:

To Assign Beneficiaries and Optimize PHC Resources.

Methods:

Two agents (Establishments and Beneficiaries) represent supply and demand to test different capacity scenarios on a national level.





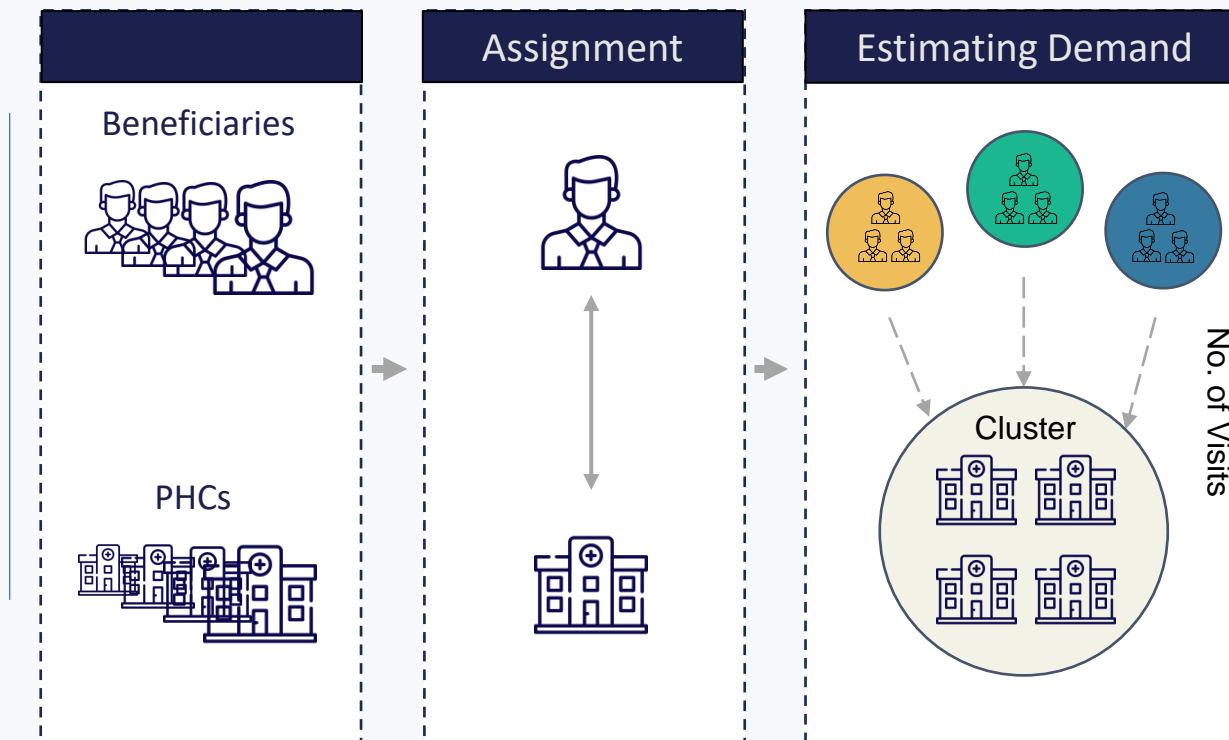
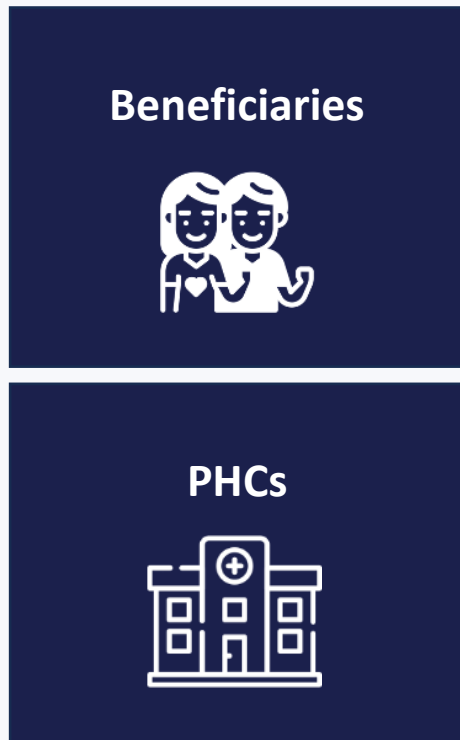
Agents



Process



Outcome



- Beneficiaries Assignment
- Daily Demand for PHCs
- PHCs Utilization
- Number of Visits per Patient






The Simulation

Methods



Agent 1: The Beneficiaries Agent allows to Model the Demand

- Beneficiaries' agent consist of four inputs and which impact demand in different ways.*

 Input	 Description	 Impact on Supply
Chronic Disease	<ul style="list-style-type: none">The presence or absence of high burden diseases.Disease Included: (Diabetes, Hypertension, etc.,)	Chronic disease count increase expected visits.
Insurance	<ul style="list-style-type: none">The insurance status of the beneficiaryStatus type: Available or not available	The availability of insurance decrease expected visit
Citizenship	<ul style="list-style-type: none">The nationality of the beneficiaryNationality type: Citizen or non-citizen	The availability of Citizenship increase expected visits
Visit rate	<ul style="list-style-type: none">The actual visit rate for the last 3 years of the beneficiary	The history of visit rate affect (-/+) the expected visit

* Limited to the information that impact the demand



Agent 2: The PHCs Agent allows to Model the Supply

PHCs agent has two main input used into the simulation model*



Input

Geospatial

Capacity



Description

- Information related to determine location such as
 - Latitude and Longitude
 - Region
 - Health Cluster
-
- PHC capacity in term of number of visits slots
 - Occupancy threshold: represented by a percentage from the visit slots.



Impact on Supply

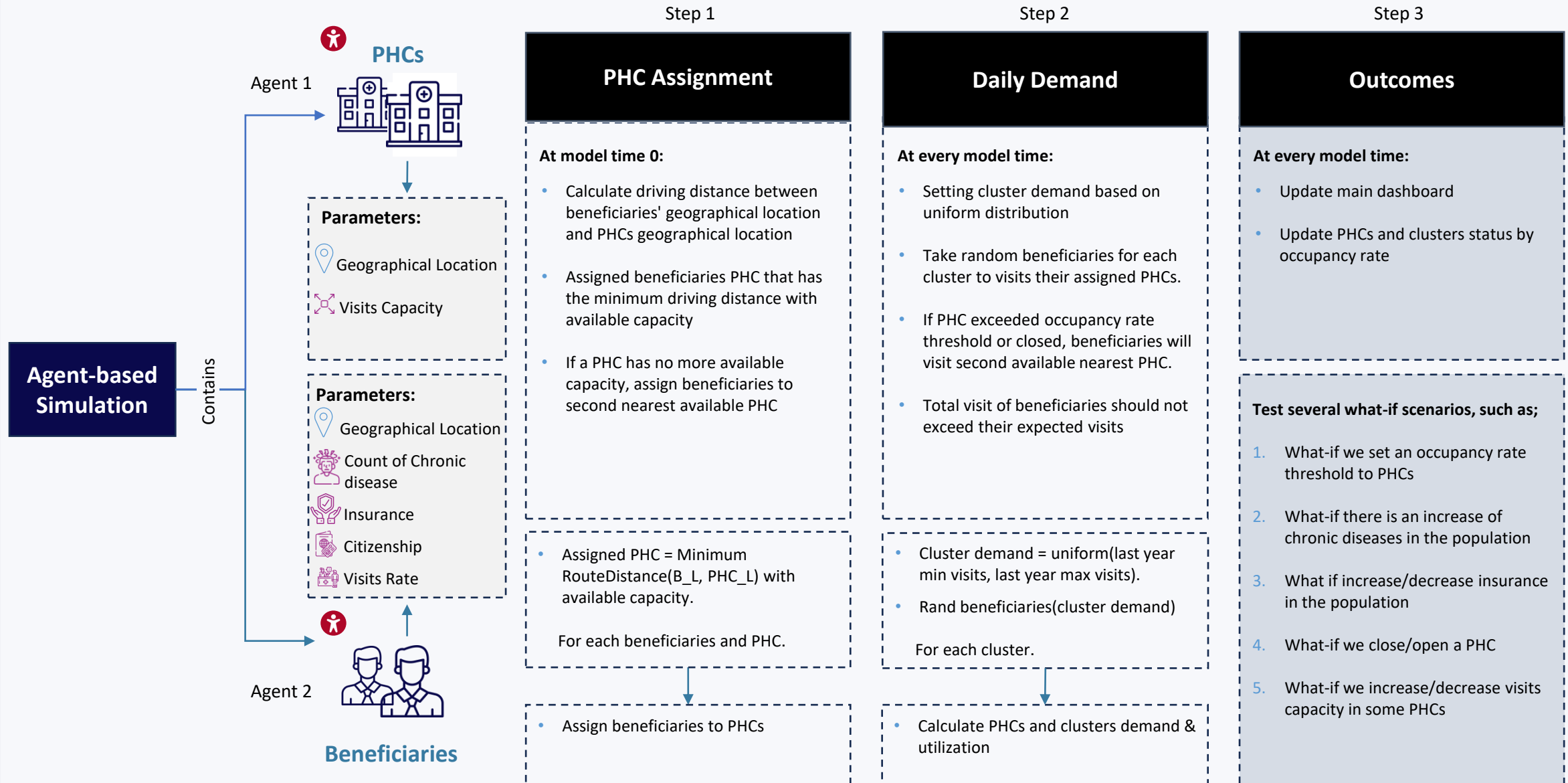
Each PHC Is assigned to a cluster based on lat. & Long.
The total capacity of a cluster is the cumulative capacity of all PHCs in the cluster.

If occupancy threshold of a PHC is exceeded, the beneficiaries will be assigned to the nearest PHC with available visit capacity.

* Limited to the information used in the mathematical model (e.g., names of PHCs are not included).



All Components Are Interacted With Each Other To Conceptualize The Real-world Scenarios.





The Application

Impact and
Productization

Catchment Area

Beneficiary Assignment and PHC Resource Optimization

Start



Key Values And Impact Of Applying Simulation On Catchment Area

Importance: Catchment Area simulation model have multiple key values that support decision making on national level.

01

Risk-free
environment

02

Data-driven
decision

03

Complex-system
analysis

Impact and beneficiaries: The simulation model involves many stakeholders, which support their decision making and help them to understand PHCs expected demand and multiple what-if scenarios in risk-free environment.

01

Enhance service
Availability

02

Minimize resource
wastage

03

Improve patient/
provider experience



Productizing The Simulation Model: Two Lessons From Previous Experience

The Challenge: Productizing simulation model is a hard sell due to trust and operation cost and complexity

