Resource Allocation for Malaria Prevention

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Malaria

- Video 1: 7 Jumbo Jets

10 Facts about Malaria (WHO)

- Fact 1:
  - can be transmitted to people of all ages.
  - bites of infected mosquitoes.
  - If not treated promptly with effective medicines, malaria can often be fatal.
- Fact 2:
  - About 3.3 billion people - half of the world's population - are at risk of malaria.
  - Every year, this leads to about 250 million malaria cases and nearly one million deaths.
  - People living in the poorest countries are the most vulnerable.

10 Facts about Malaria (WHO)

- Fact 3:
  - One in five of all childhood deaths in Africa are due to malaria.
  - Every 30 seconds a child dies from malaria in Africa.
- Fact 4:
  - Early diagnosis and prompt treatment are two basic elements of malaria control.
  - Early and effective treatment of malaria can shorten the duration of the infection and prevent further complications including the great majority of deaths.

10 Facts about Malaria (WHO)

- Fact 5:
  - Inappropriate use of antimalarial drugs in the past century contributed to widespread resistance in the malaria parasite to drugs such as chloroquine, leading to rising rates of sickness and death.
  - Over the past decade, a new group of antimalarials – known as artemisinin-based combination therapies – has brought new hope in the fight against malaria

10 Facts about Malaria (WHO)

- Fact 6:
  - The main objective is to significantly reduce the rate and number of cases of both parasite infection and clinical malaria. This is achieved by controlling the malaria-bearing mosquito and thereby reducing or interrupting transmission.

10 Facts about Malaria (WHO)

- Fact 7:
  - Long-lasting insecticidal nets can be used to provide protection to risk groups, especially young children and pregnant women in high transmission areas.
  - This provides personal protection. The nets can also protect communities when coverage is high enough (more than 80% of people in a target community sleeping inside them).
  - The nets are effective for a number of years (3 to 5 years, depending on models and conditions of use).

10 Facts about Malaria (WHO)

- Fact 8:
  - Indoor residual spraying is the most effective means of rapidly reducing mosquito density.
  - Its full potential is obtained when at least 80 % of premises with malaria vectors are sprayed.
  - Indoor spraying is effective for 3 to 6 months, depending on the insecticide used and the type of surface on which it is sprayed. (DDT is effective for longer periods, up to 12 months in some cases).

10 Facts about Malaria (WHO)

- Fact 9:
  - Pregnant women are at high risk not only of dying from the complications of severe malaria, but also spontaneous abortion, premature delivery or stillbirth.
  - Malaria is also a cause of severe maternal anemia and is responsible for about one third of preventable low birth weight babies.
  - It contributes to the deaths of an estimated 10,000 pregnant women and up to 200,000 infants each year in Africa alone.

10 Facts about Malaria (WHO)

- Fact 10:
  - Malaria causes an average loss of 1.3% of annual economic growth in countries with intense transmission.
  - It traps families and communities in a downward spiral of poverty, disproportionately affecting marginalized and poor people who cannot afford treatment or who have limited access to health care.
  - Malaria cuts attendance at schools and workplaces.
  - **However, it is preventable and curable.**

Some of the NGOs about Malaria

TAMTAM
together against malaria

malaria
NO MORE

25 APRIL
world malaria day
25 APRIL
25 APRIL

Create a page
for your own
fundraising event!
AGAINST MALARIA

AFM
AFRICA FIGHTING MALARIA

malaria
NO MORE

2.7 MILLION
NETS DISTRIBUTED BY
MALARIA NO MORE
SINCE 2006

MALARIA
DEATHS
HAVE FALLEN
BY MORE THAN
25%
SINCE
2000

- Video 2: What we do

TAMTAM
together against malaria

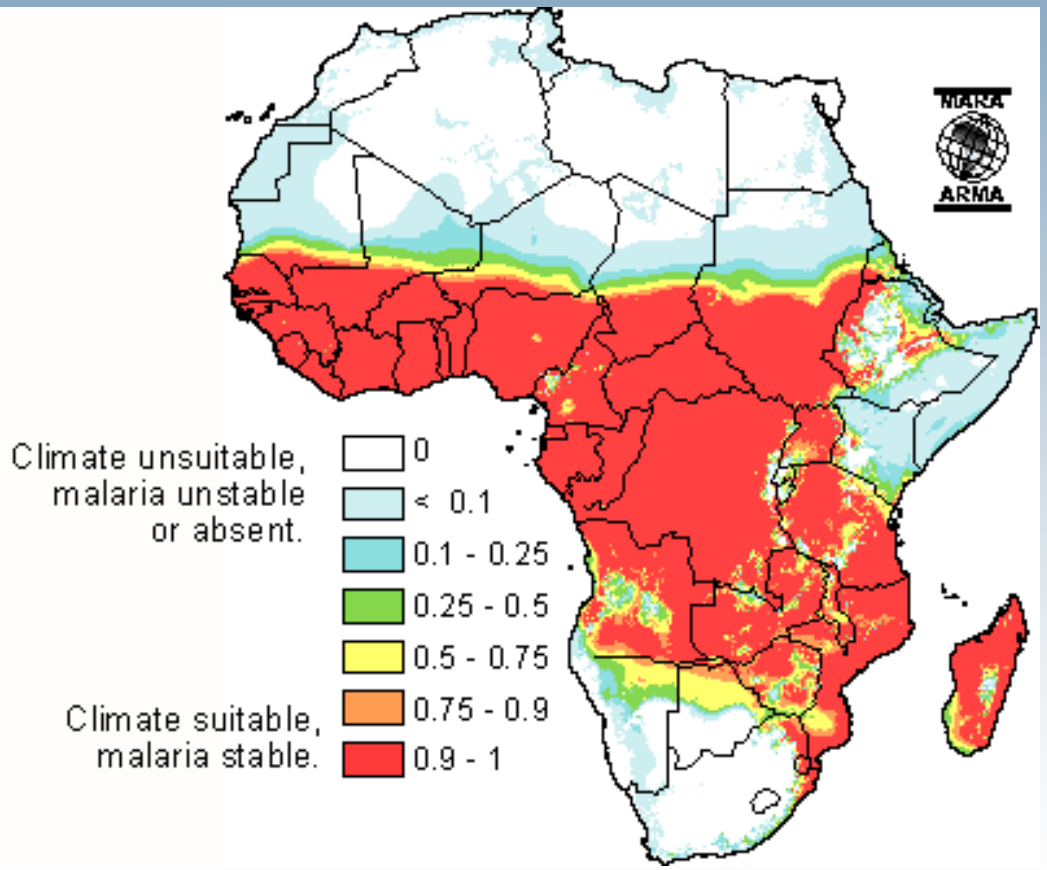
- TAMTAM was founded in 2004 by a couple of economists.
- Through their work in the rural district of Busia, Kenya, they realized that distributing bed nets is one of the most efficient means to save lives and improve the health of mothers and their children.
- TAMTAM was born out of their desire to put this finding into action
- **TAMTAM stands for "Together Against Malaria, Tunapenda Afya na Maisha".**
- **The Swahili translates to "We love health and living" in the native language of Busia.**

TAMTAM
together against malaria

TAMTAM distributes bed nets to underserved areas through innovative, cost-effective and scientifically-founded methods.

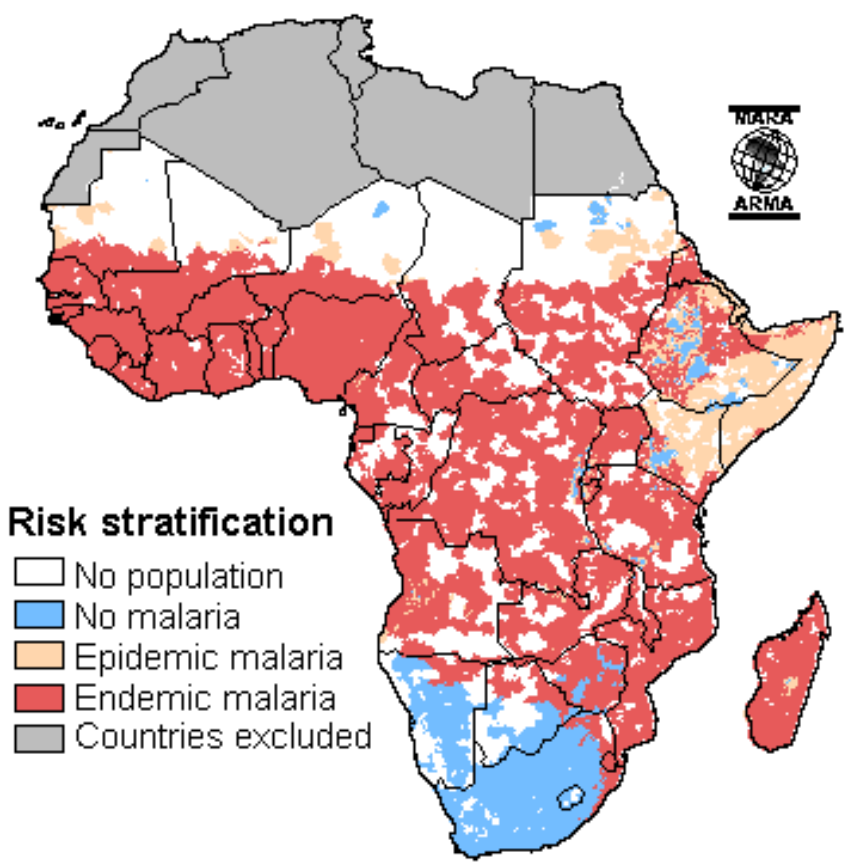
More Facts on Malaria

Malaria and Climate



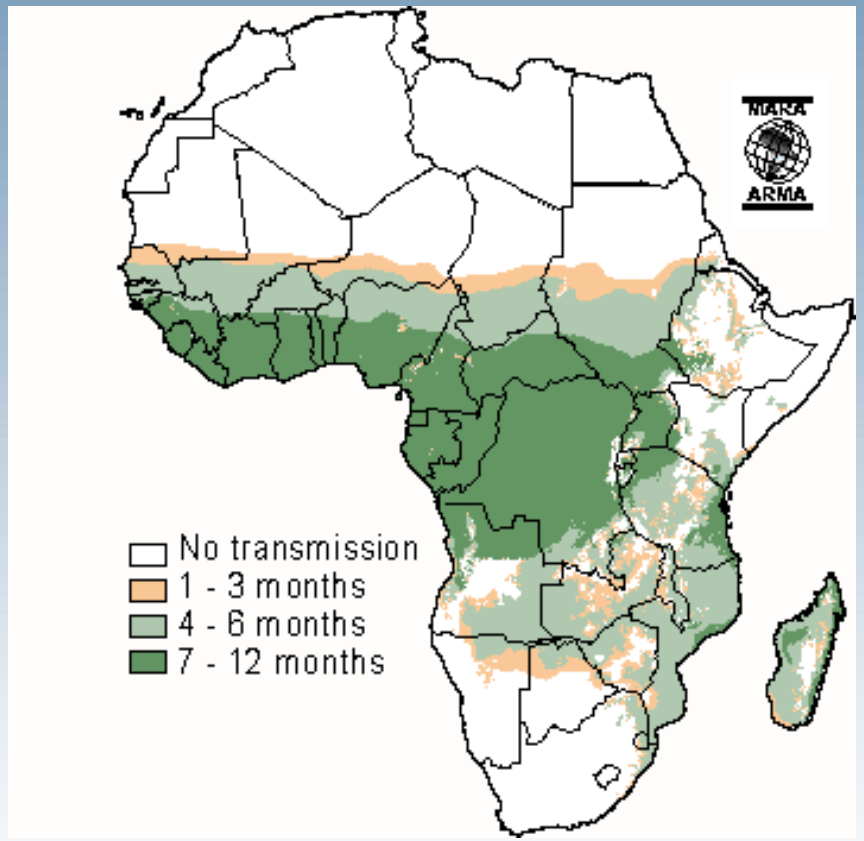
- Suitability of local climate
- Potential distribution of malaria transmission

Malaria distribution model



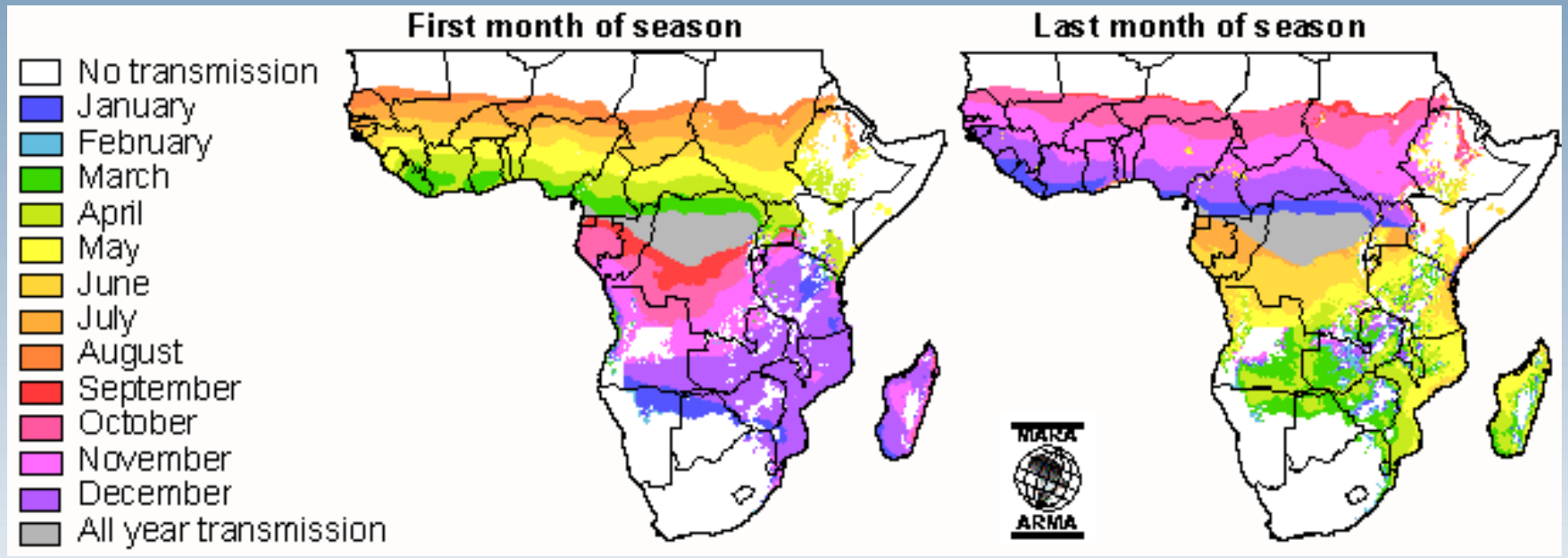
- Endemic: Regions
  - Significant transmission
- Epidemic Regions
  - Prone to distinct variation (in some years no transmission)

Duration of Malaria Transmission Session



- Yellow: Strongly seasonal and epidemic
- Light green: Seasonal and endemic
- Dark green: Perennial and endemic

Malaria Season



April 2010 Health Report

International Federation
of Red Cross and Red Crescent Societies

MAIN FINDINGS

- There is growing scientific evidence to demonstrate that combining mosquito net distribution with follow-on "hang up" campaigns, carried out by trained volunteers in their own communities, increases net usage rates and significantly reduces incidence of malaria.
- Combining net distribution with follow-on support and training at household level is crucial to reach the most vulnerable groups (such as those living in remote areas, refugees, people affected by stigma and discrimination) with limited or no access to government health services.
- Trained volunteers who live in the same community as the beneficiary population and speak the same local language are ideally placed to help families overcome social or cultural barriers that could prevent the correct hanging and nightly use of nets.
- Since 2002, as a direct result of net distributions carried out by National Red Cross and Red Crescent Societies — supported by the International Federation of Red Cross and Red Crescent Societies (IFRC) — more than 300,000 malaria deaths have been averted, while 18.2 million people have been protected against malaria.
- Significant progress has been made towards universal coverage (providing nets to every household to protect all persons at risk of malaria) and innovative new techniques are showing promising results (such as home management of malaria in Kenya), but sustainable funding needs to be available to carry the success forward, to strengthen community involvement.
- There is a need to expand operational research to determine the most effective and cost effective prevention and treatment packages.

IFRC in action

BEATING MALARIA: THE WAY FORWARD

1. Make sure sustainable funding is available to carry the success forward. Recent history in the elimination of other diseases has revealed that funding gaps lead to reduced efficiency which can lead to resurgence of diseases. Malaria can be prevented and cured.
2. Strengthen the civil society response. Malaria will be defeated by empowering communities with the knowledge and materials needed to prevent and treat this disease. Empowered communities can ensure sustained access to prevention and treatment materials from their ministry of health and local government.
3. We call for greater recognition, support and investment of community-based solutions and action. We need to ensure continued support at community level to protect gains already made in the battle against malaria.
4. Invest more in operational research. Medical research is necessary but more research is also needed to allow for data driven, efficient, and cost-effective malaria programmes on the ground.

Kenya

BEYOND PREVENTION:
HOME MANAGEMENT OF MALARIA

In Kenya, the Ministry of Public Health and Sanitation (MoPHS) partnered with a number of organizations, particularly Kenya Red Cross Society (KRCS), to set up an HMM project in 113 villages in two districts, both of which are remote and with difficult terrain, and both of which have a high malaria burden, high poverty rates and little access to public health facilities. The partnership worked well, with KRCS providing the volunteers, and the MoPHS providing supervision using mostly public health officers from local health facilities. The project was carefully monitored in order to measure results, and volunteers were trained in rigourous record-keeping to inform the research.

HMM basics

- Based on volunteers (from IFRC)
- Each volunteer is responsible from some villages
  - Distribute nets
  - Distribute ACTs for sick people
  - Checks for correct dosage usage

Jacob Karisa / Kenya Red Cross HMM volunteer / **Wakala Village**

"Before the project started, I would often see children in my community with convulsions, a sign of complicated malaria. But now since HMM, I have seen no cases of this because the children get treatment. The mothers come to me at the onset now, sometimes in the middle of the night. Malaria is always the biggest problem and I have five cases per week now. My area has a population of 1,011 and some of the villages are really spread out. So I thank God that the Red Cross gave me a bicycle so I can go to the remote areas and come back quickly. It has been very helpful to all the volunteers. The village leaders always invite me to give lectures and give information about health. What I do is educate people on many things about net use, treatment, health, sanitation and the environment. The continuation of the project is very important because of the impact it has had on communities. But it is also a big demand on the volunteers and on our time, because I am also a farmer and a father, so we need support to help manage the balance."

Mwanaisha Balla / mother / **Lamu District**

"I have four children, but one is away at the farm. They have all had malaria recently and were shivering and vomiting, so I took them to the Red Cross volunteer. Before the volunteer was here, I would take them to one of the health facilities. The nearest is not too far – only a six hour walk. I would like to have our volunteer fully trained as a doctor so she could vaccinate the children and also treat adults who are sick."

HMM (Home Management of Malaria) project is successful in Kenya

A Case study for OR usage in Malaria Prevention

- IFRC reports keep saying more OR tools
- ???

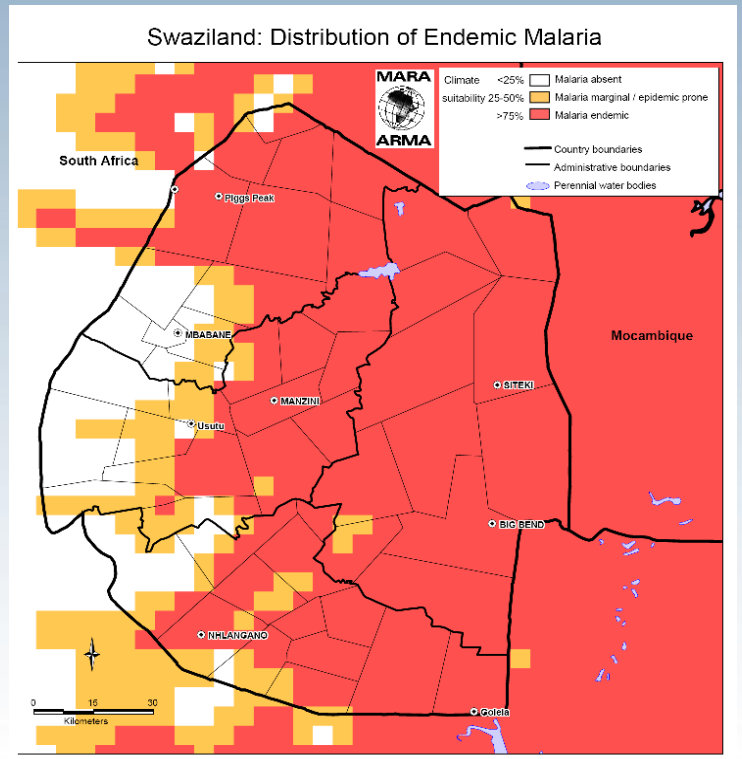
Case study

A Case Study

- Create a systems-based approach to minimize the incidence of malaria with limited resources.

- Swaziland as pilot country
  - Historical data availability
  - Wide range of conditions

http://en.wikipedia.org/wiki/Swaziland



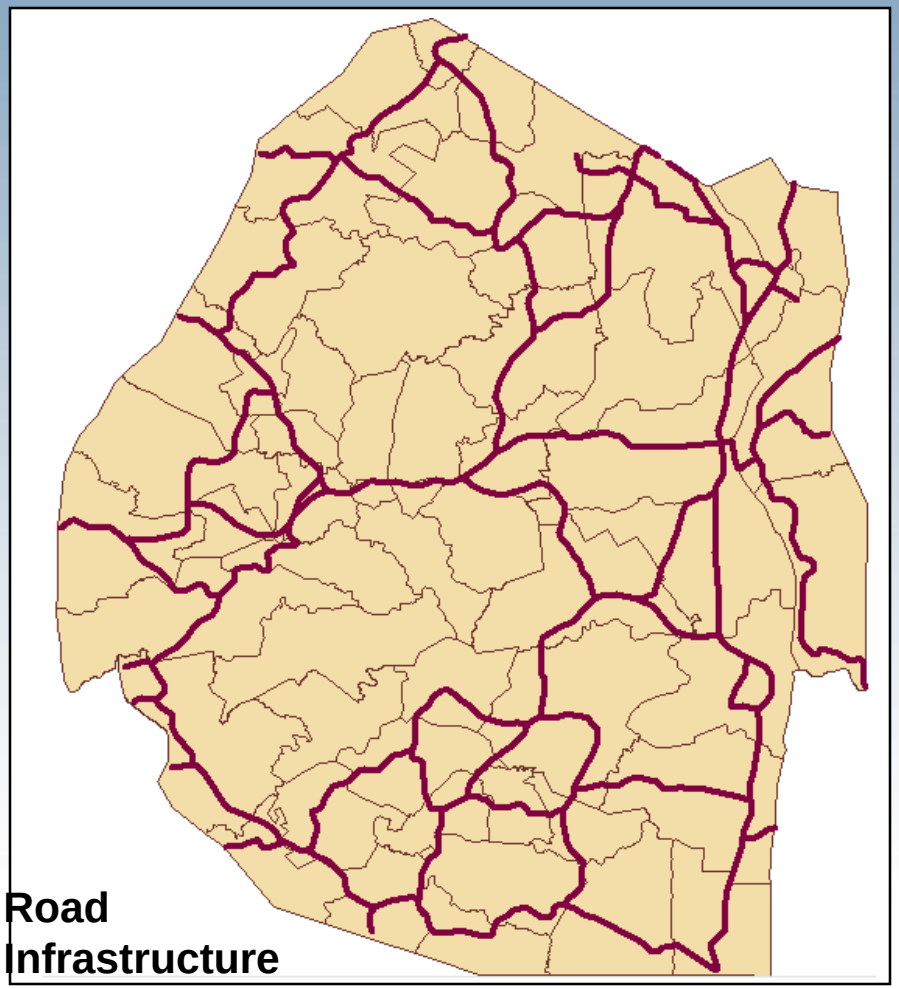
http://www.mara.org.za/

A Case Study

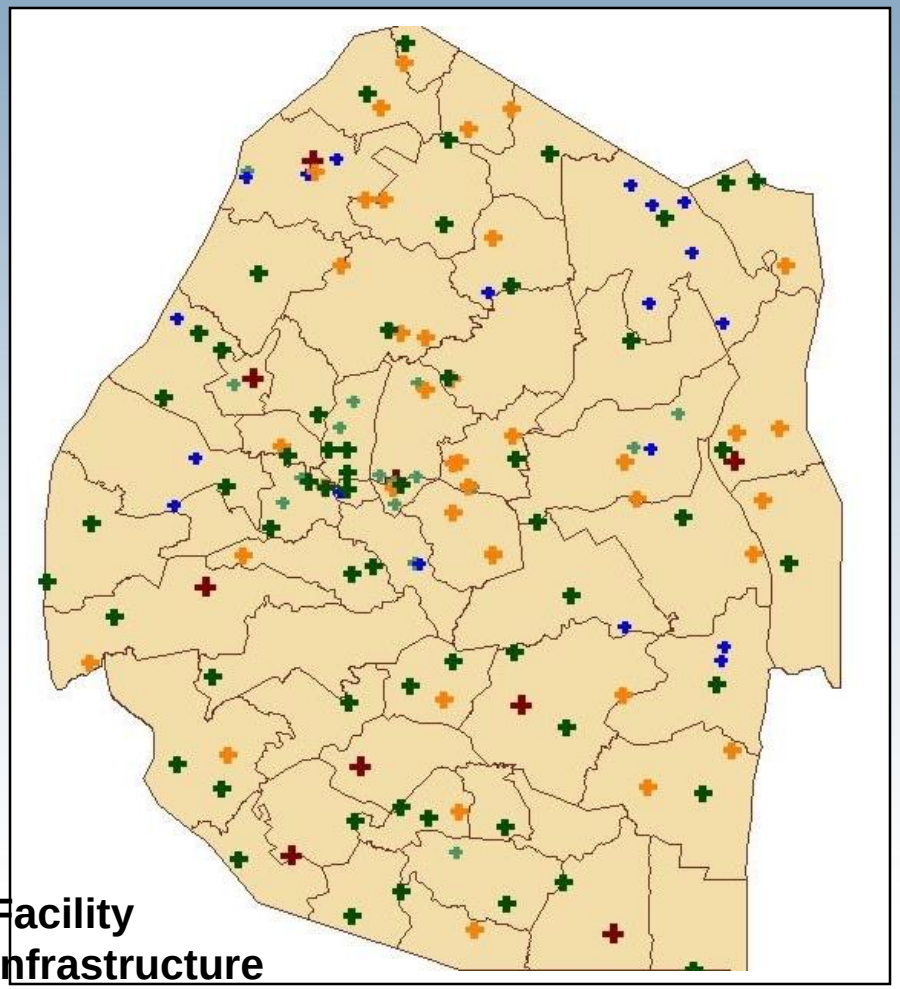
- Design a system for malaria prevention in Swaziland

- Locate distribution centers
- Assign enough crew and equipment including nets and indoor sprays, to each DC
- Design the distribution structure

Data Sources



Road Infrastructure



Facility Infrastructure

Model Objective

- An optimization model will allow for a systems-based approach to resource allocation and deployment.

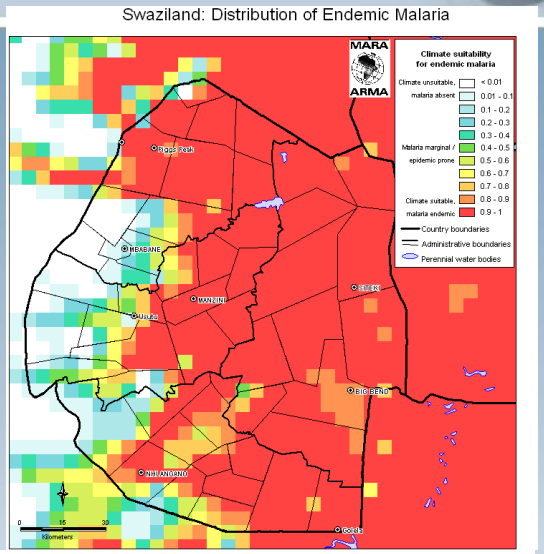
- Decisions may include:
  - Where to locate Distribution Centers (DCs)
  - How many DCs to open
  - What regions DCs should serve
  - When DCs should be open
  - When to cover each zone
  - Number of people to protect in each zone
  - Labor, trucks, equipment, insecticide/nets to base at DCs
  - Labor, trucks, equipment to allocate to each zone

DC Placement Heuristic

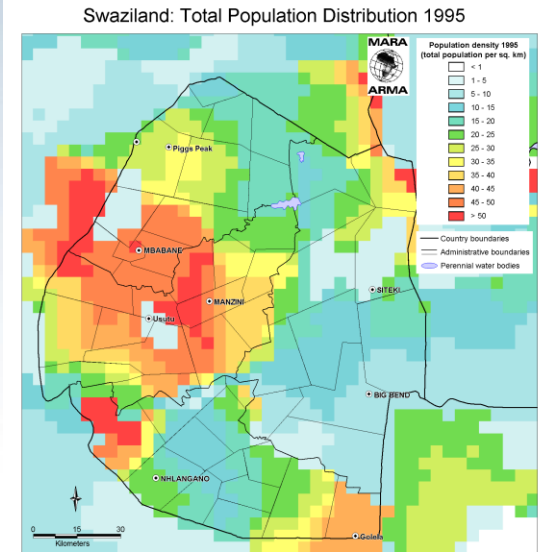
- Potential locations for DCs
  - Factors considered:
    - Population
    - Malaria risk
    - Infrastructure

DC Placement Heuristic

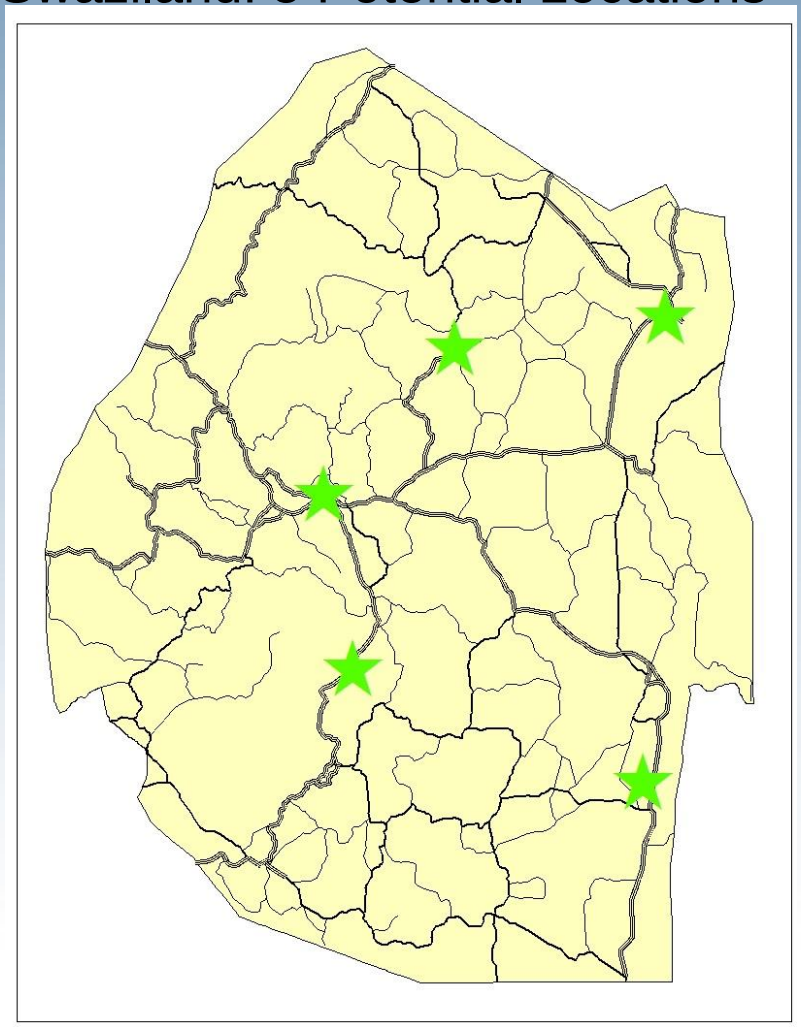
Malaria Risk



Population

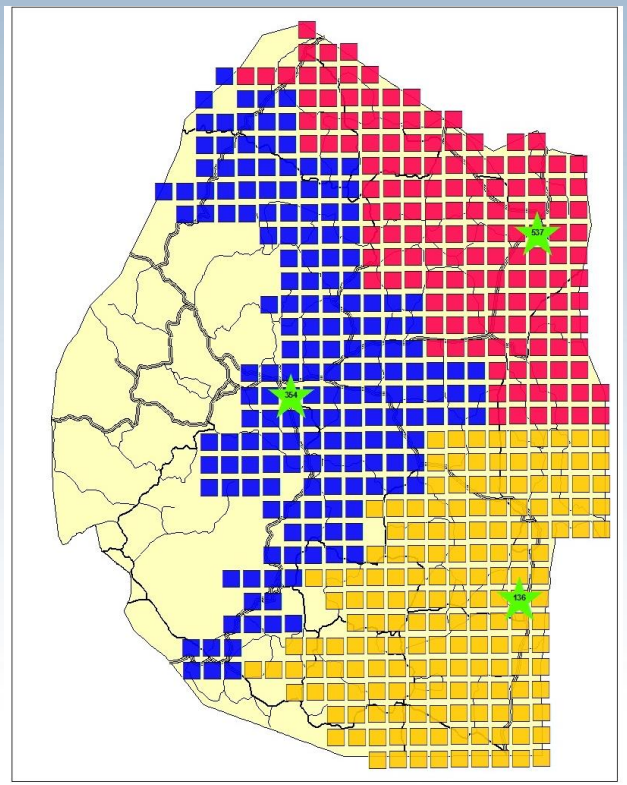


Swaziland: 5 Potential Locations

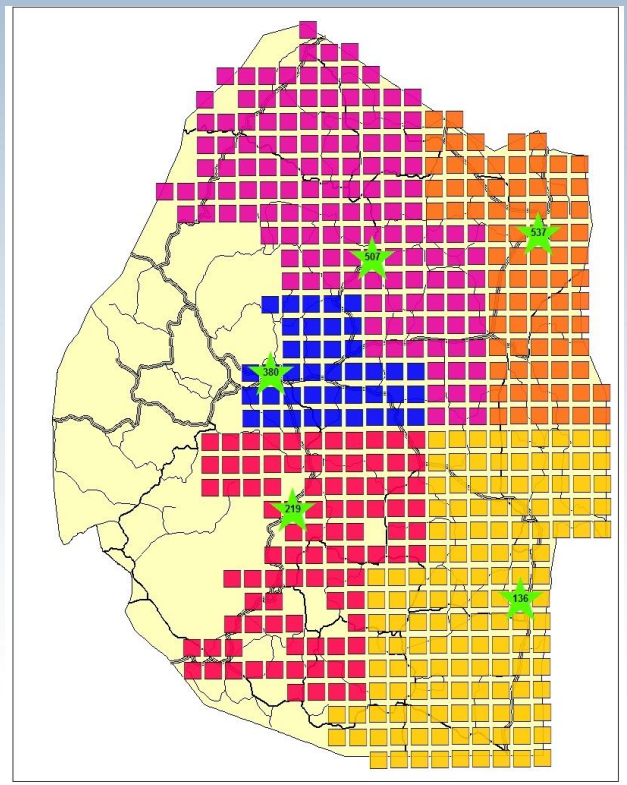


Zone Assignment Heuristic

- Customer zones are serviced by a single DC
  - Straight-line distance: DC to customer zone



Zone Assignment with 3 DCs



Zone Assignment with 5 DCs

IRS (Indoor Residual Spraying) Resource Deployment Model

- Given the DCs and the assigned zones:

- Schedule a deployment plan
  - What zones to target for spraying
  - When to deploy in each zone
  - How many people in each zone to protect
  - Resources to base at DCs

Typical Constraints

- Deployment restricted by:

Capacity	Relative Effectiveness	Costs/Budget
•Truck capacity •DC capacity • Amount of resources based at DCs • Zone population	•Duration of DDT effectiveness • Concentration of DDT per m^2 • Coverage rate of spray personnel	• Labor wages • Vehicle rental and travel costs • Equipment purchase and repair • Cost of DDT

Recommendation