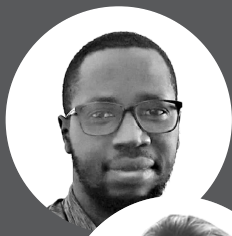
Q&A

Authors



**Sam Acellam, BMLS**
FIND
Uganda

**Juhi Gautam, MPH**
FIND
India

**Heidi Albert, MPH, PhD**
FIND
South Africa

# What is diagnostic network optimisation?

**Diagnostic network optimisation (DNO) is a form of geospatial network analytics approach used to analyse the current diagnostic network and recommend the optimal type, number and location of diagnostics and an associated sample referral network to achieve national health goals.[1]**

## What key questions can be answered through DNO analysis?

DNO helps create a digital representation of diagnostic networks that can include multiple test types, devices, sites and referral linkages. While DNO analysis should be designed to address specific country needs, some common questions include: Can current testing capacity meet existing and future demand? Are new devices needed, and, if so, how many and where should they be placed? Is there spare capacity on existing multi-analyte devices and can testing integration bring improved patient access and system efficiency benefits?

DNO recommendations may lead to various interventions, including adding or relocating devices, integrating testing on multi-analyte platforms, establishing or altering sample referral linkages between health facilities and laboratories and shaping national policy and guidelines.[2]

## How is DNO performed and how long does it take?

DNO consists of five main steps: (1) define scope, i.e. the questions to be addressed through DNO, (2) collate and prepare (existing) data, (3) run baseline analysis to identify gaps and opportunities for improvement, (4) run optimisation scenarios by making changes to the baseline, and compare across scenario, (5) select and implement outputs. DNO analyses typically take six to nine months, mainly depending on the availability and quality of existing data, the complexity of scope and the stakeholders' engagement. Implementation of DNO outputs can extend beyond this period depending on the nature of interventions selected during the analysis.

## What data are needed to conduct DNO? Who should be involved in the DNO process?

Key data inputs include geolocated information on testing sites (health facilities, hubs and laboratories or non laboratory sites), tests, devices, current and forecasted testing volumes, referral linkages and costs. Ideally, DNO should leverage existing data sources wherever available.

The DNO process described above should be led and guided by ministries of health at each step, ideally by the national laboratory directorate, with the engagement of all key ministries, disease programmes and relevant implementing partners and donor agencies.

## Where has DNO been performed, and how have DNO outputs informed diagnostic system strengthening?

DNO analyses have been conducted in a growing number of countries in Africa and Asia, many focussed on strengthening networks for improving access to HIV and tuberculosis molecular testing, while others addressed access to testing for neglected tropical diseases and strengthening antimicrobial resistance laboratory surveillance networks. DNO outputs have informed funding requests to donor agencies and shaped national strategic plans and guidelines.[3,4] For example, the Philippines, India and Kenya have used DNO to inform GeneXpert procurement and device placement plans to best meet their national tuberculosis programme goals. DNO can also help support integrated diagnostic networks, for example, in Kenya national integrated sample referral guidelines were developed based on DNO recommendations. In Zambia, DNO demonstrated how centralised and decentralised testing could be optimally used to improve turn-around time for HIV viral load testing in priority populations, i.e., viral load testing for pregnant and breastfeeding women and children and early infant diagnosis. Findings suggested that GeneXpert devices with available capacity (that primarily conducted tuberculosis testing at baseline) could be leveraged for priority HIV testing where target turn-around time for HIV could not be assured with centralised polymerase chain reaction (PCR) testing, without negatively impacting tuberculosis testing.[5] The integrated and optimised scenario would also reduce the combined cost of tuberculosis

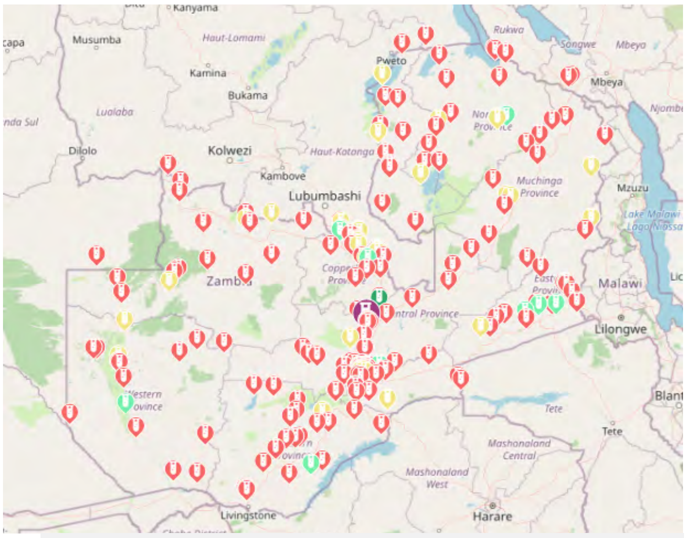



Figure 1. DNO in Zambia (baseline model). GeneXpert devices conducting tuberculosis testing were mapped using OptiDx software as a part of DNO analysis in Zambia. Most sites are red denoting low utilisation levels. HIV testing was conducted on centralised PCR devices (not displayed on the map) and samples travelled long distances, particularly from remote areas, leading to delays in test results.

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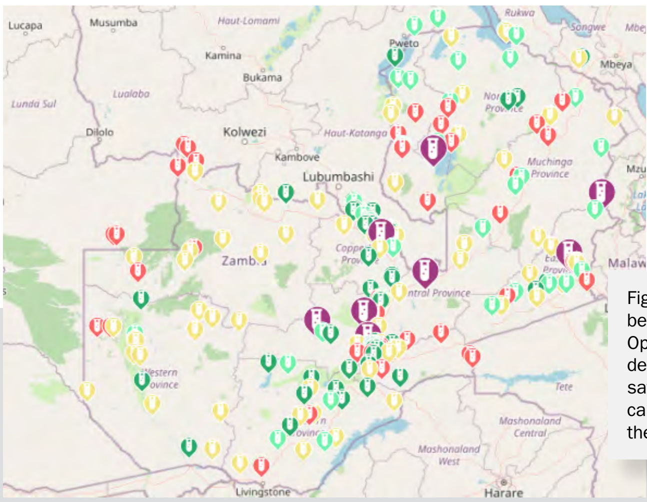
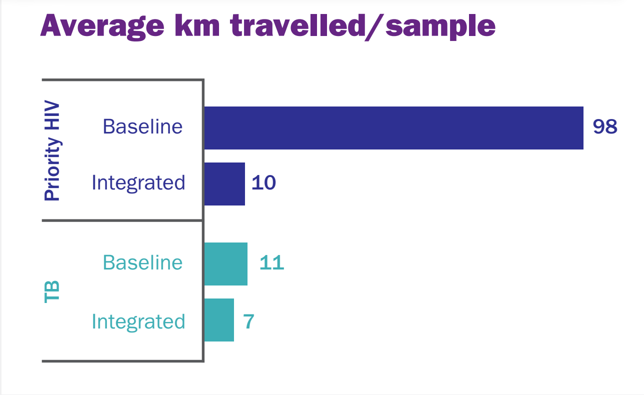



Figure 2. DNO in Zambia (optimised model). Feasibility and impact of integrated HIV-tuberculosis testing to improve turn-around times for test results was modelled using OptiDx software. The existing GeneXpert network was adequate to meet the combined demand of priority testing for HIV and tuberculosis. Compared to baseline, device utilisation would increase across most sites, while demand would exceed available testing capacity at some sites. Subsequent models were run to address overcapacity issues at these sites.

and HIV programmes by 2%, helping achieve both access and cost benefits. DNO is increasingly being proposed to inform diagnostic system strengthening in low- and middle-income countries and recommended by key donors including The Global Fund to Fight AIDS, Tuberculosis and Malaria and United States President's Emergency Plan for AIDS Relief (PEPFAR).[6,7] The African Society for Laboratory Medicine (ASLM) and FIND have recently established the DNO sub-community of practice within ASLM's Laboratory Community of Practice (LabCoP), to promote the use of DNO and various applications of geospatial analysis in the region, for furthering evidence-based laboratory systems planning and decision-making.

Figure 3. Compared to baseline, in the optimised and integrated scenario average distance travelled by priority HIV samples decreases from 98 km to 10 km and for tuberculosis samples from 11 km to 7 km.




## Suggested resources for further information:

- FIND's introductory YouTube video to DNO
- FIND's YouTube video on OptiDx, an open access DNO tool
- FIND's landscape report on various software tools to conduct DNO
- ASLM's webpage on the DNO sub-community of practice

**Citation**
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