Dashboard development and implementation for USAID local partners

Data for Decision-making: Part 1- Demand and Use of Data

Date: November 15, 2022

Right to Care: Strategic Information

ASAP
ACCELERATING SUPPORT TO ADVANCED LOCAL PARTNERS
Knowledge and skills gain

From the presentations, participants will:

- Understand the PEPFAR reporting requirements and the required preparatory analysis planning
- Understand how to gather stakeholders’ requirements for data presentation
- Learn about the different charts available and how to choose the right one for their programme
- Comprehend how to manage different data types and the systems available for processing and presenting data
- Learn how to use geospatial techniques and advanced data analytics for evidence-based programming
Outline

Day 1
- PEPFAR reporting requirements, data analysis planning and examples of operationalising surveillance systems for impact
- Development of Data Management System: Data Demand and Gathering User Requirements Specifications
- Data visualisation: Choosing the right charts

Day 2
- Methods for data, collection, storage and processing
- Demonstration of Excel and ADC Online Dashboards
- Advanced Data Analytics
- Geo-spatial planning and Use
Data to Action framework and Situation Room Approach

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Chief Strategic Information Officer
Right to Care (Group)
November 2022
Using program data at USAID- Rationale

USA D through the U.S. President’s Emergency Plan for AIDS Relief (PEPFAR) is at the forefront of utilizing data to advance development programming to meet the needs of beneficiaries and partner countries.

• USA D supports PEPFAR’s approach to:
  • Use granular data and analytic tools and insights to respond to real-time challenges and nimbly adjust programs;
  • Advance evidence-based targeting and planning informed by epidemiological and program data;
  • Enhance capacity and a data use culture to strengthen program accountability and management; and,
  • Strengthen program monitoring to increase impact and save lives.
What are PEPFAR reporting requirements and expectations for implementing partners?

A person-centred approach through:

- Understanding ART patient outcomes and continuity of treatment in the era of differentiated care (i.e., TX_ML, TX_RTT)
- Indicators (i.e., HTS_RECENT) that allow programs to better understand clusters of recently-infected patients and spur programmatic action
- Outcome-focused cascade analyses (e.g., index testing, prevention)
- A continued commitment to ensure data disaggregation
- Ensuring COP-funding for health information systems projects is impactful and supports: (1) interoperability between systems; (2) the adoption of standardized disaggregations; (3) shifts away from paper-based to electronic reporting; and (4) the adoption or expansion of HIV surveillance systems for public health response

Source: PEPFAR MER Guidance 2.6.1
Indicator reporting frequency and the PEPFAR fiscal year

**Quarterly Indicators**
Results encompass quarterly achievements from:
- October 1 – December 31
- January 1 – March 31
- April 1 – June 30
- July 1 – September 30

**Semi-Annual Indicators**
Results encompass semi-annual achievements from:
- October 1 – March 31
- April 1 – September 30

**Annual Indicators**
Results encompass fiscal year achievements from:
- October 1 – September 30

Source: PEPFAR MER Guidance 2.6.1
### Evolution of PEPFAR Finer Age Bands for Results Reporting

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Source: PEPFAR MER Guidance 2.6.1
Why do PEPFAR partners need enhanced data management systems?

- At present, the majority of PEPFAR countries are limited to programmatic aggregate data and periodic surveys to describe the HIV care continuum. With greater emphasis on patient-centered monitoring comes a need to understand patient-level data beyond the aggregate indicators.
- Periodic surveys offer individual de-duplicated data, denominators, and the 95-95-95 cascade, but are cross-sectional (one point in time) and are expensive to conduct.
- Standardized health data surveillance systems offer countries a mechanism to complement aggregate reporting systems and surveys with quality HIV data that emphasizes individual de-duplicated data to more accurately report the 95-95-95 cascade.
- These surveillance systems can offer partners the ability to:
  - emphasize case finding and case reporting of new diagnoses (including recent infections)
  - identify if the newly diagnosed are linked to treatment, and
  - provide disaggregation by age, sex, geography, and risk

- **Establishing such systems require a great deal of planning**

Source: PEPFAR MER Guidance 2.6.1
Why is it important to conduct data analysis planning?

- It is the first step in ensuring data quality
  - Completeness, Validity, Timeliness, Reliability, Integrity, Precision
- Helps define expected standards for quality data
- Helps your organisation determine how to present your data to various audience types
- Helps with developing data management tools that respond to data needs
- A plan will make your reporting efforts more efficient, effective, and lasting
- A plan makes everything easier. If you spend some time planning at the beginning of an effort, you can save a great deal of time later on, because you know what you should be doing at any point in the process
Putting project stakeholders at the centre of defining information needs: Identify your internal and external stakeholders

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<th>How Information will be Communicated (Format)</th>
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**Handout 1- Audience analysis tool**
Develop your indicators

RTC presentation 1- Handout 2- USAID- Selecting_performance_indicators

Types of indicators in USAID systems

Custom indicators- are performance indicators that reflect progress within each unique country or program context

Standard indicators- are used primarily for USAID reporting purposes (MER Guidance)

Contextual indicators- Contextual indicators are used to understand the broader environment in which a program operates, to track assumptions, or to examine externalities that may affect success, failure, or progress
Illustrative questions to guide data analysis

- Comparing actual performance against targets. (Were targets met? Why or why not?)
- Comparing current performance to the previous year (How does this reporting period’s performance compare to the last reporting period? Are we on track?)
- Comparing current performance to baseline (Does performance demonstrate a shift from the baseline?)
- Using acceptable standards to make conclusions about performance
- Analyzing trends in performance (What are the common themes and how does it compare to what is happening in the external environment?)
- Examining data for the unanticipated (What happened that we did not expect?)
- Examining data in relation to the critical assumptions (Did our critical assumptions hold during the performance period?)
Resource and structural requirements for setting up an enhanced surveillance and data management system

The Four Strategic Pillars

- Monitoring & Evaluation
- Business Solution & Innovations
- Data Analytics
- GIS and Planning

Digital health systems:
Development, enhancement and scale-up to transform and improve client care processes

Near to real time data driven decision-making that supports cost effective precision programming

Data analytics including GIS Spatial Mapping that pinpoint gaps and inefficiencies allowing for Geo-targeted solutions

Data standards and governance structures that optimize investments and ensure data quality and security
Data to action pathway for effective data management

At present, the majority of PEPFAR countries and implementing partners are inundated with multiple data sources of multiple data variables that remain fragmented. This results in limited capacity to draw insights from the data and poor programmatic decision making.

What if we could build a common data dictionary?

What if we could have an interoperable system for data integration?

What if we could build analytical algorithms for a data deep-dive?
Typical challenges and data management solutions for USAID implementing partners

**CHALLENGES**

- Data are not routinely used in real-time for continuous quality program improvement
- Digitized client level record systems do not support client-centered care
- Client data are not unified due to fragmented information systems
- Viral load samples are inefficiently tracked, results are delayed and not integrated into the client record
- Different types of clients respond to different types of care models
- Client-level data systems are not interoperable and required increased data security measures

**SOLUTIONS**

- Epidemic Control Rooms
- Optimizing and Scaling EMRs
- Integrated Data Warehouses
- Digitized Viral Load Tracking
- Client Phenotyping
- Data and System Governance

**IMPACT**

- Increased client-centered care
- Improved client retention and viral load suppression
Automated data collection and integration drives real-time daily reporting

- RTC is able to compile with PEPFAR/USAID reporting requirements at low SI/M&E cost
- Only platform to provide real time data by modality for precision programming
Examples of how to build enhanced data management systems and programme impact
Example 1- Enhancing HIV case finding through HIV real time testing surveillance

**Problem definition:**
After a year of implementation community HIV testing interventions, Right to Care’s local partner in South Africa’s yield fell below targets across the quarters with a maximum yield of 7% in an area where the HIV prevalence is known to be amongst the highest in the country.

**Intervention**
HIV real-time testing surveillance using a mobile health application to collect geolocation data.
Geospatial mapping was conducted using data collected using a mobile application called Lynx Health Application. Lynx data was used for creating GPS-based hotspot maps. The maps were used to target testing within the district, leading to an increase in HIV testing yield. Lynx data was specifically used for the following:
- Mapping Hotspots for women of reproductive age to improve case identification in children (to identify children through their caregivers).
- Mapping of Hotspots for Male children aged 10 – 14, to improve case finding in this age group.
- Expansion of case finding strategies through mapping of physical infrastructure such as schools, football pitches and churches.

**Results**
RTC local partner XXX’s case finding improved from 7% in COP 18 to 27% in COP 20.
Example 2: Operationalising the Situation Room approach - What is it?

**HIV Epidemic Control Rooms allow decision-makers to analyze data in real-time for continuous program improvement supported by change management practices**

- Source of data & process of collection is as equally important as the ‘dashboard’
- Requires behaviour change & leadership from senior managers
- Surveillance of indicator trends-high frequency data is updated with more stable source data
- Daily data review meetings with Program Managers, SI/M&E, & Ops
  - *Which facilities are performing & why*
  - *Which facilities are underperforming & why*
  - *Shifts from interventions & resource needs*

Game changer: Inclusion of Health Ministry teams and setting up Ministry daily situation rooms to review data together with RTC teams (training on the Knowledge Centre use was provided to district health technical teams by RTC)

**Impact: Routine data reviews in the situation room have contributed to improved outcomes**

Leveraging the Knowledge Centre (as a data integration system) for daily performance review, a RTC partner in the Ehlanzeni District of South Africa realized the following results:

- 6% increase in TX_CURR between March and May 2019
- 35% increase in average daily case finding
- 32% increase in Net_New/New Ratio

RTC’s Knowledge Centre facilitated identification of targeted interventions driven through real-time data availability and use
Daily Situation Room approach enhanced decisions and actions for TX_NEW

- **Extended working hours approved**
- **Deployment of SR through DOH**
- **Facilitating stronger collaborative interventions through weekly reviews**

- **15%**
  - Slight slow start, stakeholder engagements, December holidays

- **35%**
  - Enhanced Surveillance systems through daily situation Rooms: Evidence driven programming thru KC

- **57%**
  - Consolidation of SR processes, upgrading of specific visuals based on stakeholder (Ministry) feedback incl. RTC technical teams, use of predictive modeling from integrated data (LTFU, VLS completed): Value add analytics, feedback workshops ongoing with RTC technical teams

- **82%**
Improving programme performance through data analytics in Malawi and Nigeria

**NIGERIA**
- Epidemic Control Room implementation
- Analytics including information products for USAID
- EMR optimization
- High frequency reporting

**MALAWI**
- Site-level processes and data management for EMR and eMastercard
- Analytics, Training
Optimizing and scaling electronic medical records

THE SOLUTION

EMRs track clients across the continuum, generating data for improving clinical care and ultimately informing client-centered approaches and enabling cohort analyses and program monitoring.

In Malawi, South Africa & Zambia, RTC has scaled up EMR usage.

RTC has supported countries to optimize and scale EMRs by:

- Assessing existing EMRs for optimization and scale
- Aligning EMRs to treatment guidelines and reporting requirements from PEPFAR and countries
- Architecting, networking and interoperating systems for exchange of information across community, testing, facility, dispensing and lab systems
- Supporting data for action frameworks and different differentiated care models
- Providing implementation and user support
- Facilitating data-driven linkages between community and facility systems through client scheduling and outreach for early missed appointments
Value Add Analytics: Insights Data Application

- **Targeted Patient Interventions**
  - **Create Risk Score** for patients for predictive targeted interventions i.e., patients most likely to default on treatment
    - Based on all historical data
  - **Determine what factors** influence patients in defaulting
    - Outcomes will be used to improve patient care and remove barriers to remaining on treatment
  - **Use algorithm output** to provide targeted interventions and feedback into programs (down to facility)

*E.g.*, We applied predictive machine learning algorithms to anonymised, patient-level HIV programmatic data from two districts in South Africa, 2016-2018. We developed patient risk scores for two outcomes: (1) visit attendance ≤ 28 days of the next scheduled clinic visit and (2) suppression of the next HIV viral load (VL)

*Collaboration with HE2RO and BU*
WHY DO TODAY’S PROGRAMMES NEED TO INTEGRATE DATA?

THE SOLUTION

A central data warehouse matches client records and unifies data across disparate systems, providing comprehensive data for program management, predictive analytic and cohort analyses.

Centralized Warehouse
- Consensus and standards building for interoperability
- Ingestion of data sources from across the HIV continuum
- Data security protocols aligned with country regulations

Customizable Data Visualizations and Reports
- Real-time program analytics and access to high frequency data
- Customizable and interactive dashboards for use in Epidemic Control Rooms
- Pre-programmed PEPFAR/MOH reports

Surveillance and Predictive Analytics
- Client matching and de-duplication across the HIV cohort
- Cohort analyses for assessing longitudinal outcomes and true LTFU
- Case-based surveillance
Right to Care Knowledge Centre Demonstration

Data drill down
Data demand and User Requirements Specifications Gathering

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November 2022
Overview

1. Data Demand: Determinants of Data Demand
2. Developing dashboards for monitoring programs: User requirements gathering
3. Documenting Specifications
Data Demand and Use Defined

- Data Demand – When decision-makers specify what kind of information they need to inform the decision-making process and then seek it out

- Data Use - We define data use as instances where data are reviewed to inform a recommendation for action in strategic planning, policymaking, program planning and management, advocacy, or delivering services
  - Allocate resources
  - Monitoring of the project
  - Create or revise a program or strategic plan
  - Inform policy (advocate for /revise a policy)
Determinants of Data Demand

Factors that affect the decision-making process:

- ORGANIZATIONAL
- TECHNICAL
- BEHAVIORAL

The use of data is linked to demand for quality information (conceptual framework):
Development of Tools (Dashboards) for Monitoring
Purpose and Benefits of URS

• The URS describes the business needs for what users require from the system.

• User Specifications are written:
  – Early in the process, typically before the system is created.
  – By the system owner and end-users, with input from Quality Assurance.

• Process of dashboard development

• Benefits of URS

- Improves stakeholder satisfaction
- Increases project success rate
- Reduces project costs
User Requirements Specifications (URS) Gathering

- What is required?
  - Database, visuals, extract, online system
- Building off the Business Model
  - Data dictionary
  - Domain Modelling
- Provide as much detail as possible
- Clarity at foundation of building is critical
Ask the right questions

**Business requirements**
- **WHO?:** Target audience, business owner, technical owner
- **WHAT?:** problem dashboard aiming to address, Actions are the users trying to take based on this data

**Technical requirements**
- **WHO?:** should have access to this data
- **WHAT?:** existing reports that should be replicated, required metrics/measurements
- **WHERE?:** Is the data already available, Data Base, Data source

USER REQUIREMENTS GATHERING WORKSHEET FOR DASHBOARDS

**Questions to ask users**

1. How do you hope data will help you?

2. What questions are you trying to answer with the data? What problems are you trying to solve?

3. What are the key performance indicators that you measure?

4. How are these indicators defined or calculated?

5. Will you need to limit the data you see (for example, will you need to only look at results from a specific region or a specific time frame)? How so?

6. Are all the data sources you need to answer your questions currently available?

7. Are there any reports you use today that could be provided as examples of what would be useful? If so, please provide them.

8. If you had all this information in front of you, would you have enough information to take action? What action would you take? Would you need to know anything else?

Presentation 2- Handout 1- User Requirements Gathering Worksheet
Documenting Requirements Specification

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1 INTRODUCTION
1.1 Document purpose
The purpose of this document is to capture the minimum business requirements for program/project name reporting.

2 OBJECTIVE (5)
The major objectives of this project are:

3 SCOPE

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<td>Business Solutions and Innovations Manager</td>
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Testing of Tools (dashboards) after Development
User Acceptance Testing (UAT)

- **WHAT?**: A process of verifying that a user solution works for the user before it is signed out
- **WHY?**: To assess if the system can support day-to-day business and user operations as expected
- **HOW?**: UAT execution

- **WHO?**: UAT Team
Question and answer session
Choosing the right visuals/charts

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Monitoring and Evaluation
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November 2022
Why Data Visualisation?

All projects generate performance data. But not everyone knows how to *read* or *use* it.

When data is presented in a *solely textual manner* (Excel docs, CSVs), it can be *difficult to interpret* and *not see the patterns* that live within the data.

This is where the *data visualisation* comes to the rescue. Let’s look at an example, before going into some of the most used graphs
The table (i) below gives an easy and quick overview of the exact number of road accidents for pedestrians between 45 and 54 years old.

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<td>More than 75 yo</td>
<td>230</td>
<td>1</td>
<td>179</td>
<td>35</td>
<td>445</td>
</tr>
<tr>
<td>Total</td>
<td>1653</td>
<td>613</td>
<td>499</td>
<td>159</td>
<td>2924</td>
</tr>
</tbody>
</table>

But how does this compare to cyclists or motor bikers? Simple column/bar graphs being able to highlight proportions, column graph (ii) clearly shows that car accidents are more numerous than other transportation modes.

But a graph can do much more! This radar chart (C) highlights risk profiles: 15-24 and 25-34 years old are clearly at risk for car accidents, 25-34 years old for motorbiking accidents, and more than 75 year as pedestrians.

Main Questions to Ask for Choosing the Right Chart

1) Who will be the **users** of the USAID project data for decision-making?
2) What **stories** behind the data do the users want the graphs to highlight?
3) How do the users want to show the project’s achievements to date in the **most impactful manner**? For this:
   - the users need to determine one or more of the four main **properties** of data presentation
     - how data is composed (**Composition**)
     - how variables relate to each other (**Relationship**)
     - how a variable behaves in comparison to others (**Comparison**)
     - how data is distributed across dimensions (**Distribution**)
   - To choose the **right visualisations** for showing/reporting a project’s performance against MER indicator targets, a “**visualisation decision tree**” can be a very helpful tool.
Chart Visualisation Decision Tree

Source: Andrew V. Abela, ExtremePresentation.com, 2009
COMPARISON among few items:
Column Chart

Column charts use vertical bars to show comparison between categories. They present categorical data with rectangular bars, with heights or lengths proportional to the values that they represent. They are effective for showing the value at a point in time.

The bars can be plotted vertically (column chart) or horizontally (bar chart, especially useful with long descriptions).

Source: RTC/EQU P, Zambia, SAPR FY'21
COMPARISON among multiple items: Grouped Column/Bar Chart

The Grouped Bar Chart (also called: Multi-set Bar Chart; Clustered Bar Chart) is used when two or more data sets are displayed side-by-side and grouped together under specific categories on the same axis. Basically, it’s the most simple bar chart with two or more graphs.

Graph: Number of patients on Second Line ARV Regimen per IP (Haiti)
Source: EQU P/Right to Care, Haiti, APR FY’19
COMPARISON:
Over time

HIV Incidence in young women and girls (Aged 15 to 24) vs older women (Aged 25 to 49)

Percentage of condom use at last sexual encounter in young women and girls aged 15 to 24 and older women aged 25 to 49

When you have a continuous data set, it’s recommended that you use line charts. Best suited for trend-based visualizations of only a few categories over a period of time.
Comparison: Stacked Column Charts

Stacked column charts use vertical bars, divided into sub-parts, showing the cumulative values of a data item and comparing the parts to the whole. Items stacked on top of one another are differentiated by colour.

Percentage column charts are the same as stacked charts but show values as a percentage meaning that all the bars are the same length.

You can use them in the same way as stacked charts and they are particularly useful when comparing relative differences.

They are particularly useful when comparing relative and absolute differences — where the sum of the values is as important as the totals.

Percentage of clients seen during a quarter who received 3-month ARV supply or more across the four regional sites, Haiti, 2019
(Source: iSanté (10-20-2019). EQUIP Right to Care)

Annual number of voluntary medical male circumcisions, 15 priority countries, Eastern and Southern Africa, 2008–2021
(Source: UNAIDS Global AIDS Monitoring, 2022 (https://aidsinfo.unaids.org/))
**COMPARISON:**

**Tornado chart**

Tornado (or Divergent or Butterfly) Charts are essentially bar charts comparing two differing metrics at a time. Data categories are listed out vertically with the bars of differing metrics extending horizontally, on both ends of the listed categories.

These charts come in handy while comparing two data sets or metrics which are contrasting in nature such as male-female, positive-negative, and the like.

*Source: Right to Care/QodelInside, 2020*
A pie chart is used to visualize a part to whole relationship, typically representing numbers in percentages. Example:

Level of food insecurity among the respondents among people living with HIV/AIDS on follow-up at public hospitals of western Ethiopia

Source: Adugna Oluma, corresponding author Muktar Abadiga, Getu Mosisa, Werku Etafa, and Ginenus Fekadu, 2020. NHI, National Library of Medicine, Int. J Food Sci,
RELATIONSHIP:
Scatter chart and Bubble graph

Scatter plot charts are primarily used for correlation and distribution analysis, and facilitate showing the correlation (or not) between two different variables.

A bubble chart allows one to add another dimension to a scatter chart. E.g., you can add bubble size as the third variable and thus enable comparison.
Map charts are great for giving numbers a geographical context to quickly spot best and worst performing areas, trends, and outliers.

Location data like coordinates, names of provinces, districts, or community spots allow for plotting related data on a map.
Data Visualisations: Some Style Do’s and Don’ts

**Sorting:** for column and bar charts, to enable easier comparison, sort your data in ascending or descending order by the value, not alphabetically.

**Data-Ink Ratio:** remove any excess information, lines, colours, and text from a chart that does not add value.

**Labels:** use labels directly on the line, column, bar, pie, etc., whenever possible, to avoid indirect look-up.

**Colours:** (a) in any chart, don’t use more than six colours.
  (b) for comparing the same value at different time periods, use the same colour in a different intensity (from light to dark).
  (c) for different categories, use different colours. The most widely used colours are black, white, red, green, blue, and yellow.
  (d) keep the same colour palette or style for all charts in the series, and same axes and labels for similar charts to make your charts consistent and easy to compare
LAST BUT NOT LEAST:

Data visualization is not a goal in its own right – instead, it is meant to facilitate data use to cultivate a results-focused decision-making environment.
Question and answer session.
Data for Decision-making: Part 2- Using dashboards effectively

Date: November 16, 2022

Right to Care: Strategic Information
Preparing and presenting operational and analytic dashboards

Andres Montaner
Monitoring and Evaluation
Right to Care (Group)
November 2022
Data sources

Excel
  • Validations within a template
  • Visualizations within a template

Direct Online Capturing through desktop or smart device/tablet
  • Website for data input and direct import
  • Automated Data Capturing
  • DHIS2 (The District Health Information 2 Software)
    • Excel, Csv, XML, SQL
    • Visualizations within DHIS2 are possible
Data submission methods

Manual data processing
• Manual excel submissions
Network Database
  • Secure File Transfer Protocol (SFTP)
• Email submissions Direct
Online Capturing
  • Website for data input and direct import (Web forms, built in import procedures)
  • Ex: DAT M, DH S2...

Most data processing tools are a combination of these 3 depending on the available resources at data submission, review, and interaction levels (DATIM Integration System example)
Data verification methods

Verification Formulas

- Template verifications (Demo 1) *(Presentation 4- Demo 1- Excel Validations)*
- Live capturing verifications
  - Data integrity Checks and Data Queries (also built within DHIS2)

Hierarchy Approvals

- Manager review, for example, Right to Care DATIM Integration System *(Demo 2)*
- Data access rights and user authorisation (also built within DHIS2)
Data visualization software

Growing field of Data Analysis

- Looker, DOMO, Tableau, PowerBI, Databox

Assess organization software and program requirements

- Reporting vs Internal Reviews
- Visualization Demonstrations
  - Excel Pivots (*Presentation 4- Demo 2- Excel Validations*)
  - Power BI (*Presentation 4- Demo 3- Excel Validations*)
- Validations Demo (*Presentation 4- Demo 1- Excel Validations* )
- DATIM Integration System Exercise (Built on DHIS2 technologies)
## Program Action Plan: Situation Room Review

<table>
<thead>
<tr>
<th>Project Focus</th>
<th>Intervention</th>
<th>Target</th>
<th>Achievement</th>
<th>Challenge</th>
<th>Root Cause &amp; Related Intervention</th>
<th>Responsible Parties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malnutrition</td>
<td>Distribute NACs</td>
<td>40 at X site per week</td>
<td>15 distributed at previous week</td>
<td>Shortfall of 25</td>
<td>?</td>
<td>District leads, site staff, supply chain, technical leads, SI staff</td>
</tr>
<tr>
<td>Persons unaware of their HIV+ status</td>
<td>Targeted HIV testing</td>
<td>Test 80 at site x per week</td>
<td>120 tests completed at previous week</td>
<td>?</td>
<td>?</td>
<td>Testing Co-Ordinator, site leads, site staff, SI staff</td>
</tr>
<tr>
<td>Gender Based Violence</td>
<td>Counselling enrolment, PEP distribution</td>
<td>All screened for violence enrolled in counselling</td>
<td>70% enrolment over previous week</td>
<td>Gap of 30%</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>
Data visualization- Demonstration Slides
Excel Validations

- Review validations tab in example template
  - Provide logic checks at data entry level
  - Data entry staff able to view “rule” in question and data location in template to check data
- New Sheet or table for validation formulas
  - Ex: A1 = B1, A1 > B1, A1 = (B1+C1), (A1 + C1) <= (B1 + D1)...
  - True or False will be displayed
DATIM Integration System Example

- Submitting Templates on SFTP
  - Excel template submitted to Network database
- Log into online data management system
  - View roles
- Review submitted data
  - Facility, district, provincial, national
- Approve or reject data
  - Confirm or reject data validations and accuracy
- Reporting formats
  - Filter & Extract
Excel Visual

- Review Indicators
  - What can be investigated
- Pivot Table
  - Highlight all data -> Insert Pivot on next sheet
  - Select unique id
  - Trouble shoot tables
- Rows and columns
- Graphs
  - Insert -> Pivot Chart
  - Trouble shoot graph types and indicator display options
PowerBI Visual

- Selecting Data Source
  - Confirm data layout
- Select Desired Visual
  - Input indicators into X and Y axis
  - NOTE: Filters applied on page will affect all visuals on page
Question and answer session.
Advanced *Data analytics*

Dr. Silviu Tomescu
Analytics
Right to Care (Group)
November 2022
Why the need for Data Analytics: Value add to programs

• PEPFAR “ensures that every dollar is optimally focused for impact through data-driven policies”
• Data Analytics is not a nice to have, it is a need for more effective budget allocation, planning and programming

Data Analytics
Generate insight using basic and advanced analytics

• Basic (Dashboard Analytics)
  o Monitor state of program performance
  o Trend/pattern identification
  o Used to identify areas where performance is good or can be improved
  o Good at answering program planning questions
    o What is affected? where? and to some extent why?

• Advanced (Deep Dive Analytics)
  o Identify causal factors and contribution (e.g. to IIT, VL non-suppression, HIV positivity)
  o Useful when there are many factors/explanatory variables available to analyse:
    • E.g. age, sex, location, distance from facility, employment, education level, side effects, co-morbidities, mental disorders, average number of days late, number of times late/IIT, cohabiting/marital status, religion, transport
  o Good at explaining why something may be happening.
    • The why can then be translated into action
Basic analytics to power automated reporting vs. MER indicators

• All programs are judged/scored based on achieving a particular set of indicators – MER Guideline
  
   - Two levels of MER:
     - 1: Non-composite
       - HTS_TST, HTS_TST_POS, TX_NEW, TX_CURR
     - 2: Composite: Needs calculation
       - Yield = HTS_TST_POS/HTS_TST * 100
       - Linkage = TX_NEW/HTS_TST_POS * 100
       - TX_PVLS = # Suppressed ART patients / # Patients with a VL result documented within last 12 months * 100

• Required vs not required daily/weekly/monthly
  
   - Indicators not required give insights into program gaps
     - E.g. TX_PVLS is required. Gaps in the underlining indicator, how many tests done to get suppression (the denominator)

• Basic analytics and high frequency reporting (HFR)
  
   - Daily situation rooms – forum to discuss daily/weekly with different stakeholders
   - Creates better communication
   - Alarm IPs on the problem – highlights first level of danger around performance (e.g. 7% Yield last week vs 3% Yield this week).
   - Can be automated by one person
     - Reduce error
     - Reduce staffing
     - Static or interactive reports
Advanced / Deep Dive analytics (Why?)

• Capacitation
  - Especially on interpretation of analyses
  - Get insights into a key problem
    - We want to learn more about why is a problem occurring – to plan cost effective intervention

• What are the needs to perform deep dive
  - Patient level data
  - Bigger dataset – affects insights
    - more observations i.e., patient records and
    - more explanatory variables e.g. (Demographics, location, education, etc)
  - Skilled people – to do statistical analytics, descriptive and predictive analytics, principal component analysis, dimensionality reduction

• Data for action frameworks (what is the action to be taken)
  - Capacitation - leverage analytics into action for impacting programs
    - Tailored targeted intervention to address the problems
    - Impact evaluation – short term and long-term impact
    - Standardise effective interventions across all programs
Examples

General intervention

- Wanted to know if 6 months MMD could improve patient adherence
- Multimonth dispensing of up to 6 months of antiretroviral therapy in Malawi and Zambia (INTERVAL): a cluster-randomised, non-blinded, non-inferiority trial
- Influenced expansion of 6 months MMD in Malawi and Zambia

Targeted intervention

- APACE program wanted to predict those that would miss appointment or be virally non-suppressed
- Applying machine learning and predictive modeling to retention and viral suppression in South African HIV treatment cohorts
  - Predictive models to anticipate patients that would become IIT or virally non-suppressed
  - Paved way for pre-emptive HIV programming

Cost effective ways of running a program
More insight leads to more action and better patient outcomes
Targeted programming and intervention
Creates accountability for money spend
Evaluate impact of intervention
Up and down scaling
Is it worth to continue a program?


Case study:

- Problem?
  - Chief of party flags IIT

- How do we approach this challenge?
  - Conduct descriptive analysis to investigate the occurrence of IIT
  - Set up a dashboard
  - Identifying groups that are most likely to IIT for pre-emptive intervention (e.g., counselling before IIT happens)
Dashboard Analytics

- Distribution of IIT
- Prioritisation of effort (Pareto principle)
  - Assumes that “vital few” (~20%) causes account for 80% of an outcome (e.g., 20% of facilities account for 80% of IIT)
  - Useful in guiding targeted intervention to optimise best use of resources
  - Target groups (facilities, demographic groups, etc)

- Strategic considerations can be formulated based on the observations
  - Identification of sociodemographic groups to target for intervention
    - Targeting strategies
  - Program implementation

Off the shelf and free to use
Knowing which facilities have the most clients may guide deployment of limited resources.

Knowing which facilities have the largest number of clients:
- **IIT (facilities C and E)**
  - Can identify facilities where enhanced adherence counselling (EAC) may be needed
- **To follow up with (facilities E and C)**
  - Can identify which facilities could use a call centre or a client-reminder SMS platform

Does this explain what are the characteristics (age, sex, years on treatment, etc.) of clients that are associated with IIT?
- No. You may have some idea but it should be investigated
  - That is – conduct descriptive data analytics to understand why or what may contribute to, for example, high IIT/TFO

Let’s add some more variables!
Let’s look at a few more variables
- Age group and sex
- Now we can see that most IIT/TFO clients are females aged 25-44

But now we lost facility name and the number of years on treatment
- We can recall that facilities C and E did have the highest number of IIT/TFO
- And that IIT/TFO occurs most in clients under 1 year of treatment

What happens if someone is aged 45-59?
- Can they not be at risk of IIT at all?
- If we only have 4 explanatory variables (sex, age, facility and years on treatment), then we can look at one of the remaining 3.
Data Analytics Findings - Factors associated with IIT

<table>
<thead>
<tr>
<th>Outcome: OR (95% CI, p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
<tr>
<td>E</td>
</tr>
<tr>
<td>F</td>
</tr>
<tr>
<td>G</td>
</tr>
<tr>
<td>H</td>
</tr>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>FEMALE</td>
</tr>
<tr>
<td>MALE</td>
</tr>
<tr>
<td>AgeGroup</td>
</tr>
<tr>
<td>60+</td>
</tr>
<tr>
<td>[1-15]</td>
</tr>
<tr>
<td>[15-25]</td>
</tr>
<tr>
<td>[25-35]</td>
</tr>
<tr>
<td>[35-45]</td>
</tr>
<tr>
<td>[45-60]</td>
</tr>
<tr>
<td>YearsOnTreatment</td>
</tr>
<tr>
<td>5+</td>
</tr>
<tr>
<td>[0-1]</td>
</tr>
<tr>
<td>[1-2]</td>
</tr>
<tr>
<td>[2-3]</td>
</tr>
<tr>
<td>[3-5]</td>
</tr>
</tbody>
</table>

Odds ratios make a model practically useful without intensive IT infrastructure. In most cases, the counsellors are the limitation, not the lack of clients we can send for EAC. Therefore, why invest in the effort to detect all of them when we can easily focus on clients very likely to IIT.
Turning findings into action

Let’s say our solution to IIT is EAC.

<table>
<thead>
<tr>
<th>Score</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Female</td>
<td>Male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age Group</td>
<td>1-15, 35-45, 45+</td>
<td>15-35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years on Treatment</td>
<td>5+</td>
<td>2+</td>
<td>1-2</td>
<td>0-1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aggregated Score (IIT Risk)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
</tr>
</tbody>
</table>

- You can only counsel one person, who would it be?
  - A: Female, 45+, 1-2 years on treatment?
  - B: Female, 15-35, 0-1 years on treatment?
  - C: Male, 15-35, 0-1 years on treatment
- What if you can counsel 2 persons?
DISCUSSION AND PROBING

Who has faced a recurring problem with in your program?
- an example for the deep dive analytics process
Question and answer session.
Geospatial techniques and analytics

Dr. Dorman Chimhamhiwa
GIS and Planning
Right to Care (Group)
November 2022
Outline

1. Data elements for defining geolocation
2. GIS data collection tools
3. Integrating locational and non-locational data in the GIS environment
4. Geo analytics and visualization in support of enhanced programme implementation – some examples
5. Quick GIS practical
Decide how geolocational information will be defined

Examples of Programme support Areas (Health related)
- HIV
- TB
- Vaccination
- Health Systems Strengthening
- Voluntary Medical Male Circumcision
- Adolescent Girls and Young women

Geo location data defined in different ways:
- Coordinates
- Addresses
  - Street, suburb, settlement/town
  - Village, settlements,
  - Community
- Health facility providing care
- Laboratory
- Other health access points e.g., pick up points, adherence club locations
- Defined landmarks
- Service routes
- Other mechanism of defining location
Set up efficient GIS data collection systems

- Real Time
- Mobile Application based
- Online/Offline synchronization

GIS teams collect different data elements such as:

- GPS Coordinates of health facilities, points of interest
- Specimen pick up points.
- Infrastructure and communication services availability at each facility
- Other critical data

• Systems can be built from simple to complex, depending on needs and resources
Key programme and non programme data is geo-mapped in appropriate GIS software.

Some key Steps
- Data structuring, formatting, cleaning
- Pulling nonclinical data into GIS
- Integrating clinical data into GIS
- Conducting simple spatial analytics
- Conducting complex/advanced spatial analytics
Data analytics and visualization in GIS guides targeted implementation

- GIS showing visual presentation of programming gaps and areas to focus on
- Leads to improved targeting on interventions

Brown areas show poor vaccines uptake
Example 1:
Supporting HIV Programming using GIS

1. First 95 : Testing

Geo spatial mapping of:
- where we should be testing in the community
- where hotspots are
- where the target population is highly concentrated
- Facility and community level driven participatory mapping of disease burden and risk profiling
- Integrated analyses using multiple datasets

2. Second 95 : Treatment

- Mapping spatial patterns of ART uptake to identify areas with greatest gap in care
- Monitoring spatial patterns of ART coverage over time
- Supporting community tracking of LTFUs through track and trace tools

3. Third 95 : Suppression

- Visualize spatial distribution of retention and viral suppression to identify areas with poor retention and suppression that require targeted interventions
- Identify areas with high rates of viral suppression, where patients can be treated in the community
- Visualizing facility level viral suppression and access
- Planning for viral load scaling up (Strengthening specimen transportation and resource optimization)
- **where should we place what resources** - e.g. pickup points, viral load analyzers etc
Data driven analyses supports identification of potential high yield areas

- Analysed community testing data to determine where we still see potential for high yield testing – thus prioritising team deployment.
Facility vs Community Testing Geo analyses inform where to deploy resources.

- How does the clinic results compare to the community testing results?
- Should testing and treatment programs be continued in the area or should resources be deployed elsewhere?
Participatory Mapping strengthens targeting of Community Testing areas

“In its broadest sense, participatory mapping means creation of maps by local communities”

We use participatory mapping to:

a) Understand how health facilities perceive their population
b) Where is the catchment?
c) Where are the Key Populations?
d) Where has community testing been done?
e) Additional 3rd party data is then overlaid to get a better picture
Saturation analysis guides deployment of resources and identification of gaps

Background

• Finding PLHIV is becoming an uphill task resulting in high testing rates and low yield, the low yield may suggest limited targeted testing or saturation. Saturation in terms of HIV testing is reached when all the PLHIV within a community have been tested and know their status.

The following were our specific objectives;

• Perform HIV testing saturation analysis
• Identify facilities that have considerably lower TX_CURR than the Naomi estimates yet obtaining lower testing yield
• Highlight for intervention toward the improvement of HIV testing strategy

Saturation Yield and legend Interpretation

<table>
<thead>
<tr>
<th>Low Yield</th>
<th>High Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield &lt; 5%</td>
<td>Yield &gt;= 5%</td>
</tr>
</tbody>
</table>

- **High Saturation**
  - **TX_CURR/PLHIV > 90%**
    - Good. People are on treatment. Low number of people testing => No need to focus efforts
    - Potential people accessing care here from outside.

- **Low saturation**
  - **TX_CURR/PLHIV < 90%**
    - Improve testing in this area. Improve who we test.
    - Testing is good, still gaps to care. Focus more training here. Continue what they are doing.

35 sites were identified to have a saturation below 90% and a yield below 5%
Example 2:
Supporting Covid19 Vaccination using GIS
1. GIS dashboards: help understand coverage at local level, monitor weekly progress at settlement & ward level

2. Use GIS dashboards and printed maps to conduct micro-level planning, population segment targeting & planning of ideal outreach locations

3. Ramp up targeted interventions e.g., Demand Creation using appropriate tools

4. Vaccinate in identified critical wards & settlements

5. Field/survey to capture and monitor direct vaccination daily

GIS tools are linked for strengthened implementation and better results.
Some data Limitations to consider

1. Data access limits due to Protection of Personal Information legislations
   - limits the geo analyses that can be done.
2. High population mobility distorts “geo mapped” picture.
3. GIS Data quality gaps (incompleteness, currency, etc)
4. Data linkage challenges e.g. vaccination data vs registration data
Use of GIS to support Targeted and Enhanced Programming- A Practical Demonstration

Files:

Presentation 6: Data file 1- SocialMobilizerApp_Data-eThekwini
Question and answer session.