

Tutorial — Adapting WHO HIV DAK L2 Artifacts to Ethiopia

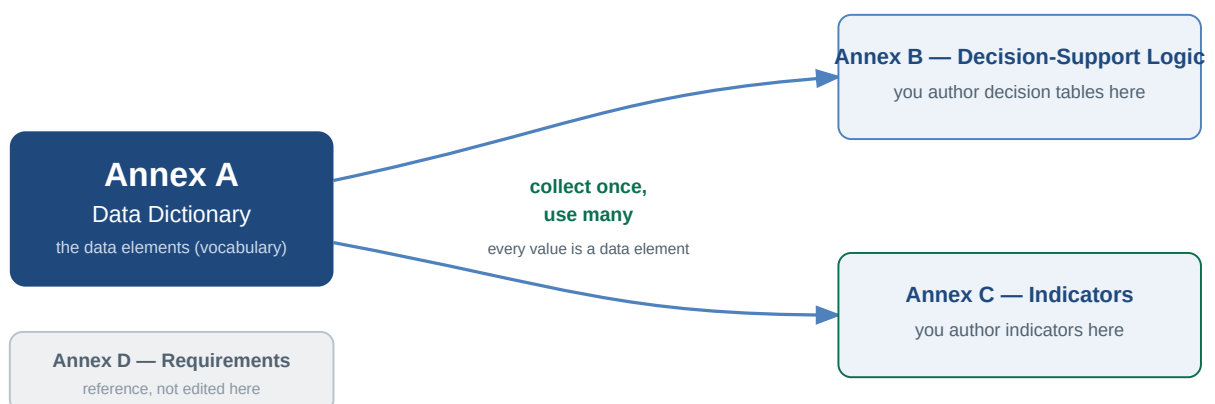
A hands-on walkthrough. By the end you can: read each DAK annex, follow the WHO authoring conventions, and adapt **two kinds of artifact** to Ethiopia — a **decision-support table** and an **indicator** — in the exact format that feeds the L3 FHIR Implementation Guide.

Start here: Ethiopia's DAK is **already heavily localized** — the data dictionary differs from the WHO default by 298 added, 204 removed, and 1,124 modified elements (full delta in the companion **change report**). So the work is **reviewing, wiring, and validating** what already exists, not authoring from a blank generic DAK. The two cheat sheets capture the repeatable recipe; `[confirm: ETH]` marks the few points still to settle against national guidelines.

Part 1 — Orientation: the files you work in

A WHO DAK ships as a narrative PDF plus four Excel **web annexes**. Three matter here, wired together by one rule — **collect once, use many times**: every value a decision table or indicator uses must first exist as a **data element** in the data dictionary.

The DAK Excel annexes — collect once, use many



1a · Data Dictionary (Annex A)

The project's **vocabulary**. Organized into **12 clinical module tabs** (Registration, HTS visit, PrEP visit, Care-Treatment, HIV-TB, PMTCT, Diagnostics, Follow-up, Referral, Prevention,

Surveillance, Configuration), plus COVER and README. (*WHO HIV DAK 2nd ed.; data dictionary v1.0.0-beta.*)

How to read a row — each row is one data element:

Column	What it tells you
Activity ID	the workflow step it belongs to
Data Element ID	the stable handle, e.g. HIV.B.DE94
Data Element Label	human name, e.g. "Test result of HIV assay 1"
Description and Definition	meaning, units
Multiple Choice	Select one / Select all that apply / Input Option
Data Type	Boolean, String, Date, DateTime, ID, Quantity, Coding, Codes , ...
Input Options	the coded answer options
Quantity Sub-type	Integer / Decimal / Duration
Calculation · Validation Condition	derivation formula; data-entry rules
Required	R required / O optional / C conditional
Linkages to Decision Support Tables	which table(s) consume this element
Linkages to aggregate indicators	which indicator(s) consume this element
Mapping to code systems (+ relationship)	ICD-11 / LOINC / SNOMED / national codes; Equivalent / narrower / broader

The two **Linkage** columns are your map: filter a module tab by them to see exactly which elements feed a given table or indicator.

1b · Decision-Support Logic (Annex B) — you author here

One table per decision point, written as a **DMN** (Decision Model and Notation) spreadsheet. Column convention used by the WHO HIV IG: **Rule ID** · **Condition Inputs** (one column per input element) · **Output Type** · **Action** · **Guidance** · **Annotations** · **Reference(s)** — with a declared **Hit Policy** (e.g. *Rule order*) and explicit operators (**=**, **IN**, **>=**, **<**, **is NULL**, **=True/=False**). Read a rule left-to-right: *when the inputs match these conditions → produce this output and action.*

1c · Indicators (Annex C) — you author here

One block per indicator, using the L2 template fields: **short name** · **indicator definition** · **category** · **what it measures** · **rationale** · **numerator definition** · **numerator calculation** ·

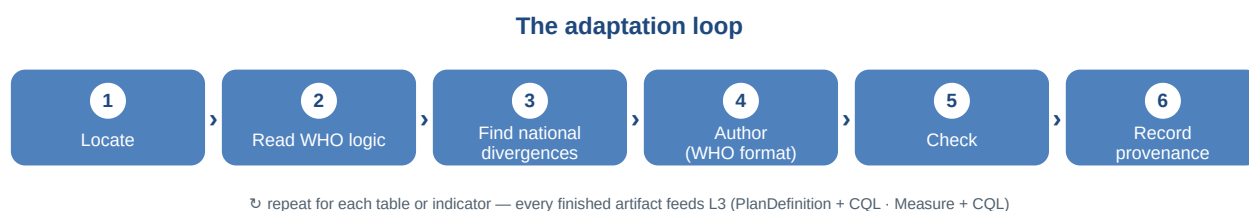
denominator definition · denominator calculation · disaggregation description · reference (plus DAK ID and the WHO Strategic Information reference number). Read an indicator by checking its numerator/denominator point at real **data-dictionary elements**.

1d · Requirements (Annex D)

Functional / non-functional system requirements. Not edited in this session; know it exists.

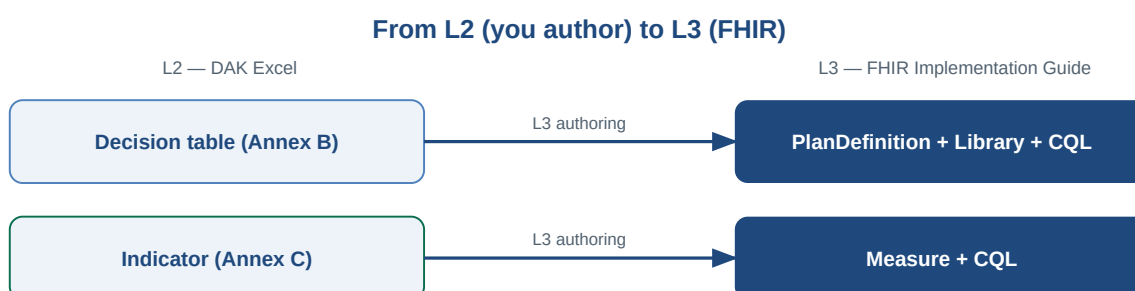
Part 2 — The authoring method

Adapting any artifact follows the same loop. You start from the WHO version (never a blank page) and author the **~20%** that is national.



The rules that keep an artifact valid: - **Collect once, use many** — every value used must be a data element in Annex A. Need one that isn't there? **Add it to the dictionary first**. - **Changes propagate** — add, remove, or re-value a data element and you must update every table and indicator linked to it. The *Linkages to Decision Support Tables / aggregate indicators* columns in Annex A are your impact map. - **Decision tables follow DMN** and stay small — **avoid 10+ inputs** (split into separate tables). - **Indicators must be computable** from routine data. If a metric needs a survey or external aggregate (e.g. condoms distributed, key-population coverage), it is **not** a DAK indicator — it is measured elsewhere. - **Preserve clinical-safety logic** when you adapt — don't drop a WHO rule by accident. - **Record provenance** — note what diverged from the WHO DAK and why; track the version.

A finished artifact is the direct input to the L3 FHIR IG:



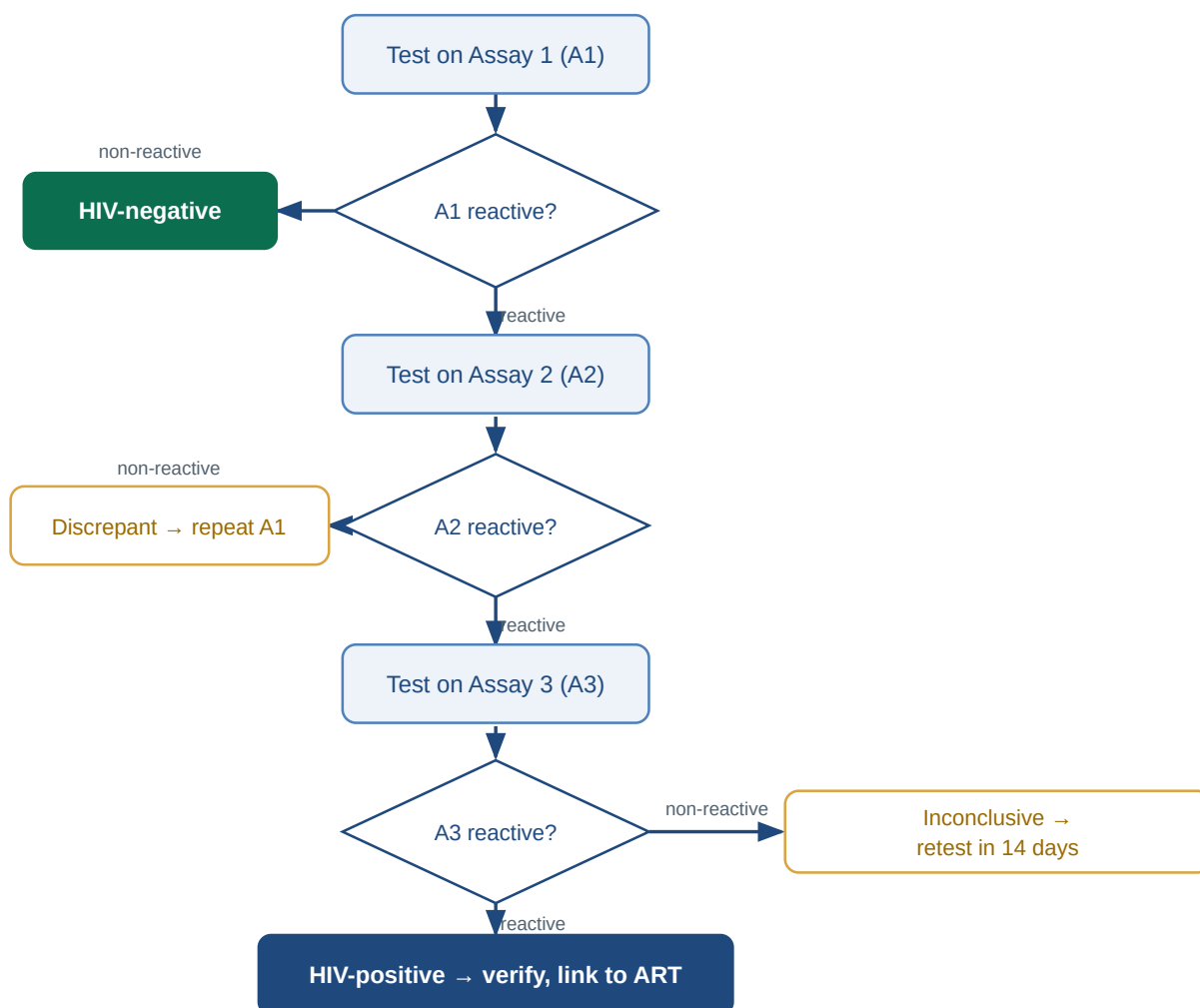
Part 3 — Walkthrough 1: a decision-support table

Example: the national HIV testing algorithm.

What a decision-support table is. A set of rules that turn recorded inputs into a recommended output/action — the computable form of "if the guideline says X, do Y." A national HIV testing algorithm is one of the most country-specific examples: every country sets its own assays and test sequence.

What Ethiopia already changed here. [HIV.B7.DT](#) is one of the most-adapted tables in the dictionary (+21 / -1 / 31 modified): Ethiopia added an **"Invalid"** result value, **verification-on-discordance** and **retest-before-ART** steps (the latter wired to [HIV.D12.DT](#)), and a **maternal-serology reuse** in PMTCT. Some additions still have **blank linkage cells** — so this walkthrough is about **wiring and reconciling those existing changes**, not authoring from scratch.

The logic you are encoding:



Step 1 — Locate. In the Data Dictionary → HTS visit tab, filter *Linkages to Decision Support Tables* for the testing-algorithm table. You get its inputs and output, including:

[HIV.B.DE90/91/92](#) (**Assay 1/2/3**), [HIV.B.DE94 / DE97 / DE100](#) (**Test result of HIV assay**

1/2/3, coded *Reactive/Non-reactive*), **HIV.B.DE93** (**Assay 1 repeated**) with its result **HIV.B.DE103**, and **HIV.B.DE107** (**HIV test result** — the output; coded HIV-positive / HIV-negative / HIV-inconclusive).

Step 2 — Read the WHO logic. Write down the safety invariants you must keep: everyone tested on Assay 1; **A1 non-reactive** → **HIV-negative**; reactive proceeds **serially A1 → A2 → A3**; **discrepant** (**A1+** ; **A2-**) → **repeat Assay 1**; **inconclusive** → **retest at visit date + 14 days**; infants <18 months → route to EID/virologic logic.

Step 3 — Find the national divergences [**confirm: ETH**] : which national products are A1/A2/A3; serial vs any parallel step; the retest interval; whether re-test-to-verify before ART is required; which entry points/modalities are in use.

Step 4 — Author (in the Annex B format; Hit Policy = *Rule order*). Each input cell points at a dictionary element + coded option, not free text:

Rule ID	Result A1 (DE94)	Result A2 (DE97)	Result A3 (DE100)	Output: HIV test result (DE107)	Action / Guidance
B7-R1	= Non-reactive	—	—	HIV-negative	report negative; window-period retest if recent exposure
B7-R2	= Reactive	= Reactive	= Reactive	HIV-positive	verify per policy; link to ART
B7-R3	= Reactive	= Reactive	= Non-reactive	HIV-inconclusive	retest at visit date +14 days [confirm: ETH]
B7-R4	= Reactive	= Non-reactive	—	(discrepant)	repeat Assay 1 (DE93), record result (DE103); if still discordant → inconclusive → retest +14d

Step 5 — Check. ≤10 inputs ✓; every input/output is a dictionary element ✓; all safety invariants present ✓; add **Reference(s)** (WHO HTS 2019 + the Ethiopia national HTS guideline).

Step 6 — Record provenance. In **Annotations**, note what changed from the WHO generic table and why (e.g. "A1/A2/A3 set to national products X/Y/Z per Ethiopia HTS guideline").

Produce it (the workshop output). Open the WHO **Annex B** (2023.28), sheet **HIV.B7.DT**. The current rules **B7.DT.01–08** branch only on Reactive/Non-reactive — **add the Invalid branch(es)** (Invalid on an assay → handle per national SOP), confirm the national assays in the **HIV test type** condition, and save it as the Ethiopia Annex B. That edited sheet **is** the deliverable.

Where it goes (L3). This table becomes a FHIR **PlanDefinition** + **Library** + CQL — preserve the rules above so the safety behavior is not re-broken downstream.

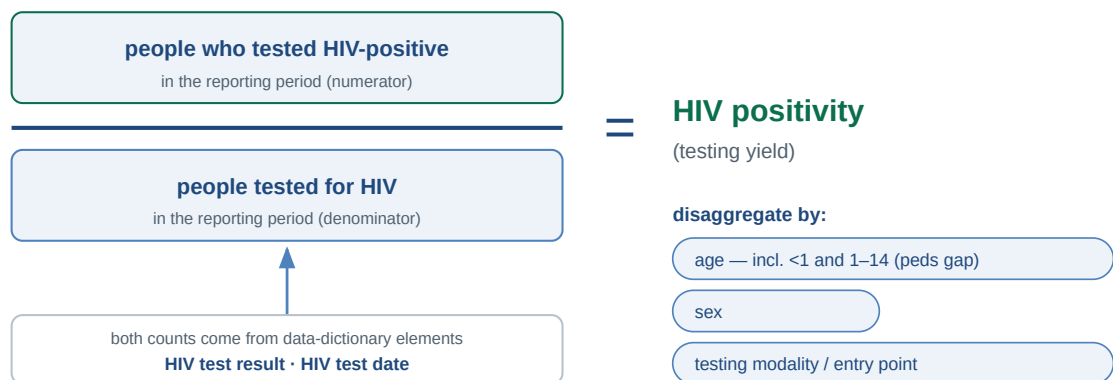
Part 4 — Walkthrough 2: an indicator

Example: HIV testing positivity (yield).

What an indicator is. A measured number — a numerator over a denominator, built from recorded data — used to monitor program performance. HIV testing positivity runs off the **same** element the testing algorithm produces (the HIV test result, `HIV.B.DE107`), so one piece of logic serves both care and reporting.

Two Ethiopia wrinkles to handle. The HIV test result now **also lives in Ethiopia's new Surveillance module** (`HIV.Surveil.DE2`) — so decide the **source of truth** the indicator reads. And several referenced elements moved or changed in the DD — so positivity uses the **localized** result and disaggregation value sets (re-point and adopt them as-is).

The shape you are encoding:



Step 1 — Locate. Confirm it's **computable**: positivity = (tested-positive) / (tested), both counts over routine data ✓. (Contrast metrics that need a survey or external/aggregate source — condoms distributed, needle/syringe, condom use, KP-know-status, KP-on-ART — which are *not computable from routine DAK data*; they are measured elsewhere, not authored as DAK logic.)

Step 2 — Read the WHO logic. The numerator and denominator both reference data elements that already exist in the dictionary — **HIV test result** (`HIV.B.DE107`) and **HIV test date**. Nothing new to add.

Step 3 — Find the national divergences [`confirm: ETH`]: which disaggregations Ethiopia reports, and the exact national definitions of "tested" and "positive" so the indicator reconciles with existing figures.

Step 4 — Author (in the Annex C template): - *Numerator definition*: individuals with **HIV test result = HIV-positive** in the reporting period. *Calculation*: `COUNT clients where [HIV test result]=HIV-positive AND [HIV test date] in period`. - *Denominator definition*:

individuals **tested** in the period. *Calculation:* `COUNT clients where [HIV test date] in period`. - *Disaggregation:* **age incl. <1 and 1–14** (the pediatric gap), sex, testing modality/entry point, location. - *Reference / DAK ID / SI ref:* fill from the DAK indicators annex.

Step 5 — Check. Numerator and denominator come only from dictionary elements ✓; align to national reporting (**PEPFAR MER HTS_TST / HTS_TST_POS**; DHIS2/HMIS) `[confirm: ETH]`; **reconcile against a known total** (e.g. last quarter's positives) as a validity check.

Step 6 — Record provenance. Note any divergence from the WHO indicator definition and the national reference.

Produce it (the workshop output). Open the WHO **Annex C** (2023.29), **Indicator definitions**, row **HTS.2. Re-point** the named inputs to the localized IDs — `Date HIV test results returned` → `B.DE58`; HIV test date/result → the Surveillance element you chose as source of truth — **add Invalid handling** to the numerator, and set the disaggregation to the localized value sets. The edited row **is** the deliverable. (A "removed" element is usually just renumbered — search the DD by label for the new ID before assuming it's gone.)

Where it goes (L3). This indicator becomes a FHIR **Measure** + CQL (sharing a common `IndicatorLogic` library).

Part 5 — Keep going

The loop is always the same — **Locate** → **read the WHO logic** → **find the national divergences** → **author in the WHO format** → **check** → **record provenance** → **hand to L3** — for the next table or indicator. Two one-page cheat sheets — one for **decision tables**, one for **indicators** — are the quick references to keep beside the annexes.