# Introducing OMOP

The Observational Medical Outcomes Partnership (OMOP) is a Theory of Everything (TOE) for health data consisting of a Common Data Model (CDM) and a tools ecosystem that runs on top of the CDM to provide data profiling, cohort definition and cohort tracking services through the various pathways that together form Universal Health Coverage (UHC).

Uses of OMOP
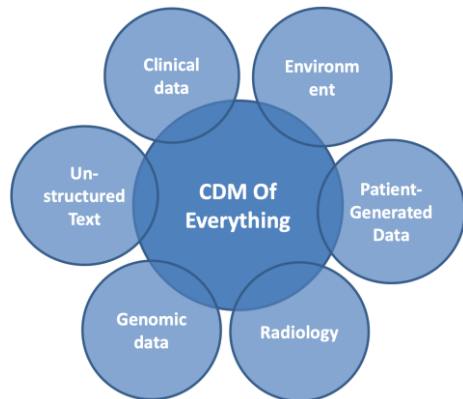
From The Common Data Model of Everything in Medicine

CDMs in general and OMOP specifically began as a way of doing secondary observational research with electronic health record (EHR) information.

At first it wasn't future proofed.

With extensions for patient-generated survey data and more recently the occurrence of genomic variants, OMOP has become more future proofed.

Building on its support for survey data, INSPIRE is finding a way for OMOP to include both cross-sectional and longitudinal population survey research.

With the inclusion of *cross-sectional and longitudinal population research*, INSPIRE seeks to grow the "grand unification" to include health events that both *precede* and *succeed* the medical events that transpire in clinical settings through which populations of individuals pass.

With this addition of *health events and labs recorded in the field*, the CDM of Everything is positioned to perform a *360-degree surveillance* of infectious and non-infectious diseases on a *single platform.*

0

The INSPIRE Addition

The addition consists of a conceptual and a logical model. Together these models universally and indistinguishably map all longitudinal population studies to the Observational Medical Outcomes Partnership (OMOP) Common Data Model (CDM), enabling (meta)data collected from many diseases to be commingled in a single OMOP CDM instance.

Conceptual model
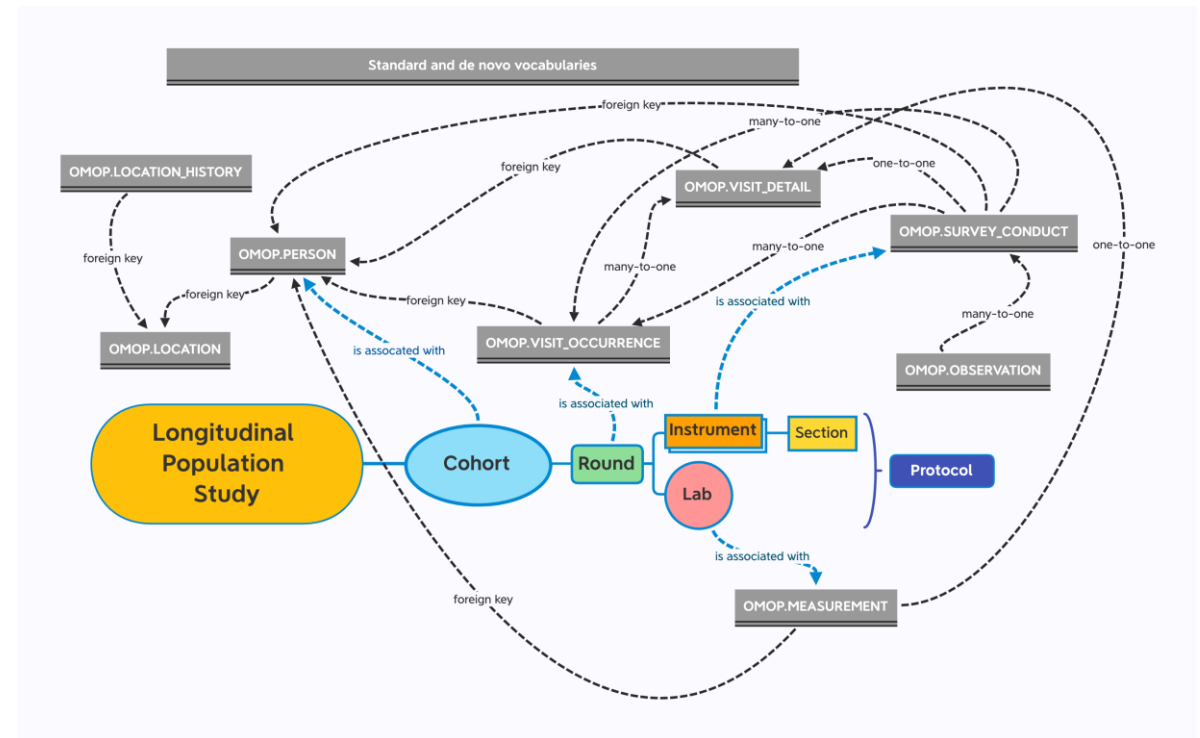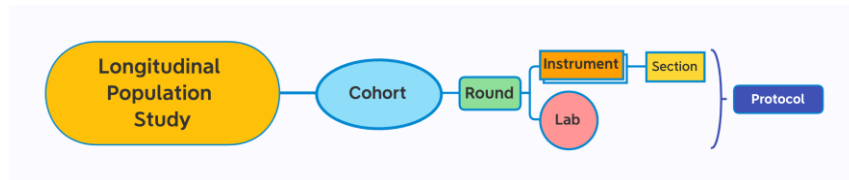
Logical model

The INSPIRE Platform as a Service

The INSPIRE addition together with the rest of OMOP, including its ecosystem of services, is implemented as a Platform as a Service (PaaS) that runs on most cloud providers.

The INSPIRE PaaS components

In order to perform ***360-degree surveillance*** of infectious and non-infectious diseases on a ***single platform***, the INSPIRE PaaS either includes (*) or will include (⁺) these components:

o The core OMOP v6 Common Data Model (CDM)* .

o Extensions to the CDM in support of genomic surveillance⁺·

o ACHILLES data profiling services*.

o ATLAS cohort definition, cohort characterization and universal health care assessment (cohort pathway) services*.

o The AEGIS Geographic Information System (GIS) tool that locates and clusters disease cohorts and their medical pathways*.

o The Vensim System for causal loop tracing and simulation ⁺·

(Meta)data Sharing
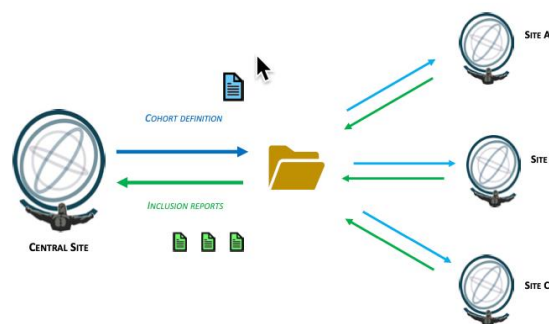
From **Using Atlas in a federated network with remote databases**

Many studies can be mapped to the same OMOP CDM instance.

And many INSPIRE instances can exchange the same (meta)data from these longitudinal population studies in workflows, using built-in OMOP CDM tools for authentication and authorization, configured in line with service level agreements between (meta)data consumers and producers.

The typical steps in this workflow are:

o Create cohort definition in the central (consumer) site and export definition.

o Distribute cohort definition file to data producers via any file exchange mechanism.

o The remote INSPIRE instance imports the cohort definition file.

o An ATLAS "inclusion report" is generated at the remote (producer) site and the report is exported to a "results file".

o The "results file" contains cohort data. It is returned to the central (consumer) site by way of a secure file exchange mechanism.

o The central site, using ATLAS, opens the original cohort definition, and for each data source (producer) opens the "results file" it has received into OMOP.

In this workflow, the data producer gets to review each "inclusion report" it receives and determines whether the data request it contains is in line with its service level agreements.

Putting it all together

The INSPIRE work streams

On the on-ramps side, for HIV currently there are two work streams in play:
- The ALPHA-to-OMOP bridge
- The HICDEP-to-OMOP bridge

On the on-ramps side, for COVID-19 there are also two work streams in play:
- A Longitudinal Population Study-to-OMOP bridge
- The WHO COVID-19 CRF-to- OMOP bridge

On the off-ramps side currently there are two work streams in play that can service either HIV or COVID-19:
- One is a *sentinel surveillance* and *universal health coverage assessment* executive dashboard that works hand-in-glove with OMOP ATLAS
- The other is an analysis dashboard that renders and simulates *causal loop diagrams*

The file exchange service that pulls rectangular files from the OMOP data lake on demand is in the future.

The INSPIRE file exchange dashboard

INSPIRE implements two data sharing services – PUF caddy and Cohort caddy as follows:
- PUF caddy enables public use file data sharing between network participants
- Cohort caddy is powered by ATLAS. It enables cohort data sharing between network participants

Both services are governed by Service Level Agreements (SLAs).

Both services support discovery and (meta)data exchange in line with these SLAs.

PEACH is an East Africa INSPIRE Network funded by IDRC.

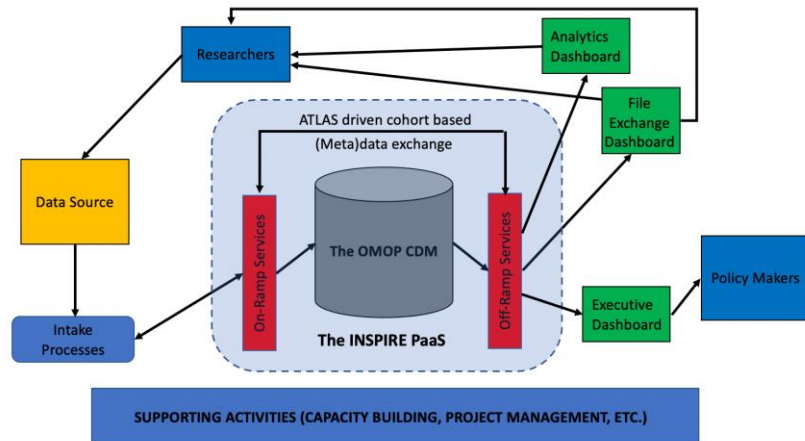The PEACH dashboard implementation works with several network configurations:
- HDSSs and hubs may be hosted by the same cloud provider.
- Alternatively, they may be hosted by different cloud providers.
- Alternatively, an HDSS may run in a Local Area Network.

Multicloud communication is tricky and our implementation at first will be modest.