

Adoption of the OHDSI *GIS Workgroup* for Schizophrenia Research

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Background

Schizophrenia affects ~1% of the global population and remains a major cause of disability. Early symptoms often overlap with depression and bipolar disorder, delaying diagnosis and treatment. Reliable biomarkers and scalable approaches for early intervention are still lacking.

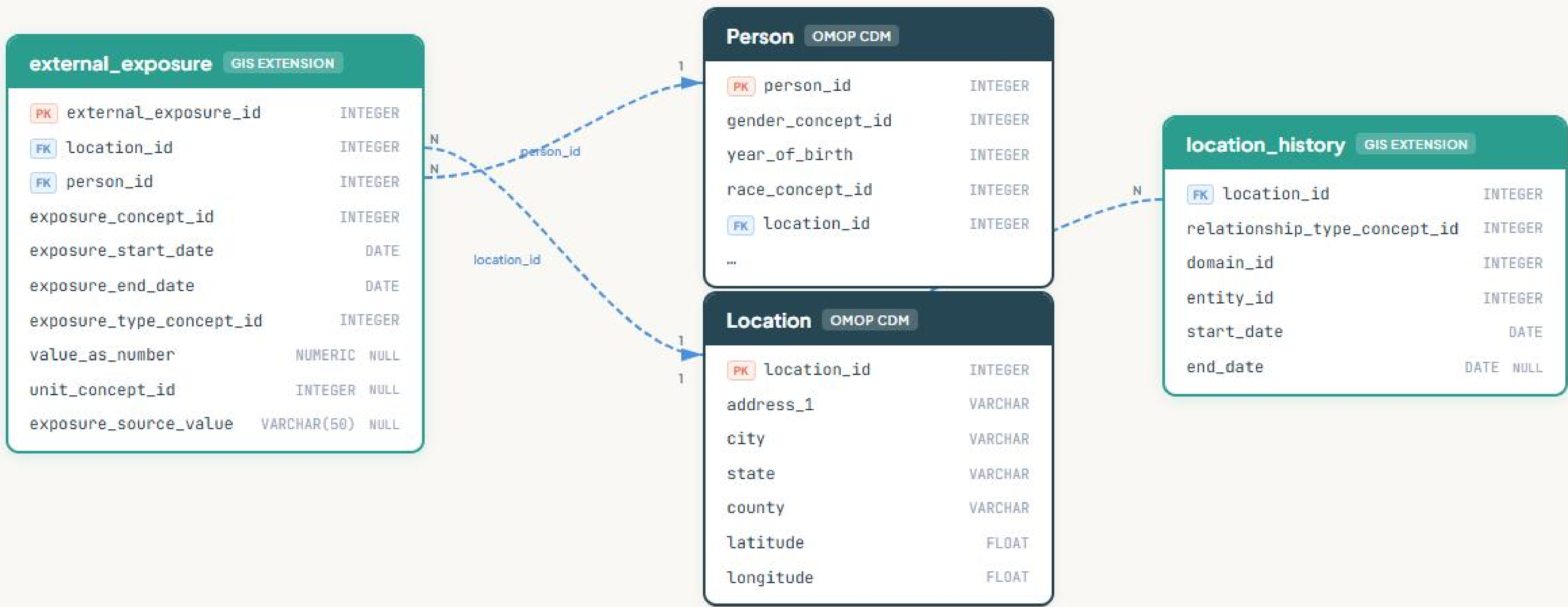
VOLABIOS addresses this challenge by integrating multi-omics, AI/ML, and real-world data from six European countries within the OMOP Common Data Model. In addition to clinical and biological information, environmental and geographic factors are increasingly recognized as important drivers of schizophrenia risk and progression.

To support this effort, we adopted the OHDSI GIS Workgroup framework to harmonize spatially resolved environmental exposures within OMOP CDM, enabling standardized and reproducible schizophrenia research.

OMOP CDM — GIS Schema Extensions

Entity-relationship diagram showing the External_Exposure and Location_History extension tables and their joins to the main OMOP CDM

GIS Extension Table Main OMOP CDM Table PK Primary Key FK Foreign Key Relationship (FK)



The ETL pipeline followed a three-step approach aligned with OHDSI best practices:

- 1 Mapping** environmental exposure variables to standard OMOP vocabularies, extending conventions using GIS Workgroup guidance where needed.
- 2 Representing** spatial attributes through location, exposure, and observation period tables aligned with OMOP CDM conventions.
- 3 Linking** environmental exposures geographically and temporally to individual records via standardized location identifiers.

Two retrospective datasets were converted to the OMOP CDM following GIS Workgroup recommendations:

- A GeoHealth dataset:** clinical data linked to **environmental exposures** (air quality, land use, noise, deprivation, light pollution) from European registries.
- B Synthetic dataset:** patient-level **clinical + demographic data** with geo-referenced census tract IDs from Virgen Macarena University Hospital, Seville.

Conclusion & Next Steps

This work successfully adopts the OHDSI GIS Workgroup conventions to harmonize retrospective environmental exposure data into the OMOP CDM for schizophrenia research. This method facilitates reproducible, interoperable analyses with current OHDSI tools by allowing standardized, spatially and temporally resolved representation of environmental determinants. This foundation offers a scalable path for upcoming multi-site and federated studies within the OHDSI network and reinforces the incorporation of environmental context into schizophrenia research. This approach aligns with VOLABIOS goals by enabling interoperable, privacy-aware, and clinically trusted data pipelines for early detection. Future work will expand GIS concept sets, refine exposure modeling, and evaluate model performance in prospective clinical settings.

Future work will investigate adding volatilomics data to the OMOP CDM, inspired by the OHDSI Genomics Workgroup. Because volatile organic compounds may capture early biological alterations linked to schizophrenia, volatilomics could support earlier diagnosis and better patient stratification when integrated with clinical and environmental data.

References

- Hany M, Rizvi A. Schizophrenia. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan– [updated 2024 Feb 23; cited 2026 Feb 6]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK539864/>
- European Commission. VOLABIOS – Volatile organic compounds and multi-omics biomarkers for early detection of schizophrenia [Internet]. CORDIS; 2024 [cited 2026 Feb 6]. Available from: <https://cordis.europa.eu/project/id/101156162>
- Observational Health Data Sciences and Informatics (OHDSI). Geographic Information Systems (GIS) Workgroup [Internet]. OHDSI; [cited 2026 Feb 6]. Available from: <https://ohdsi.github.io/GIS/>
- Moreno A, Moreno J, González V, Salas S, Segura C, de Luque V, et al. GeoHealth: Geographic Information System for Health Management and Clinical, Epidemiological and Translational Research. Stud Health Technol Inform. 2022;290:1084–1085. doi:10.3233/SHTI220279.