



ISPAD–Breakthrough T1D Research Fellowship Progress Report

Project title: Spatiotemporal Trends in the Epidemiological Profile of Type 1 Diabetes in the Metropolitan Area of the Aburrá Valley, Antioquia, Colombia: The STEP-T1D Study.

Principal Investigator: Juan Pablo Pérez Bedoya, BSc, MPH, PhD Candidate.

Host institution: University of Antioquia, Medellín, Colombia.

Academic partner institutions: University of Seville and the Americas' Network for Chronic Disease Surveillance (AMNET).

Financial support: International Society for Pediatric and Adolescent Diabetes (ISPAD) and Breakthrough T1D.

Supervisor: Professor Paula Andrea Díaz Valencia, MD, Esp, MPH, PhD, University of Antioquia, Medellín, Colombia.

Co-supervisors:

- Professor Noël Christofer Barengo, MD, MPH, PhD, Florida International University, Miami, Florida, USA.
- Professor Juan Ramón Lacalle Remigio, MD, PhD, University of Seville, Seville, Spain.

Reporting period: November 2025–July 2026.

1. Introduction:

Type 1 diabetes mellitus (T1D) is a chronic autoimmune disease characterized by the destruction of pancreatic β -cells, leading to lifelong insulin dependence and a considerable risk of acute and chronic complications. Globally, the incidence and prevalence of T1D have increased over time; however, the magnitude and evolution of the disease vary considerably across geographic regions and time periods. Moreover, available estimates may be underestimated, particularly in settings with limited surveillance systems, incomplete data, and substantial underreporting (1-7).

In Latin America, and particularly in Colombia, epidemiological evidence on T1D remains limited and heterogeneous. Consequently, the temporal and spatial distribution of T1D incidence, prevalence, and mortality across different age groups and regions of the country remains insufficiently characterized and, in some contexts, largely unknown (3,4).



The metropolitan area of the Aburrá Valley, in Antioquia, represents an important setting for studying the epidemiology of T1D because of its substantial population density, the demographic and urban transformations experienced in recent decades, and ongoing changes in lifestyles and various environmental determinants.

Against this background, the STEP-T1D Study aims to analyze temporal and geospatial trends in the epidemiological profile of T1D in the metropolitan area of the Aburrá Valley during the period 2014–2025. The study integrates multiple data sources and employs capture–recapture methods to improve the estimation of the disease burden, together with advanced temporal and spatial epidemiological methods. Through this approach, the study seeks to generate more robust epidemiological evidence to contribute to strengthening T1D surveillance, monitoring, and healthcare planning strategies in Colombia.

2. Progress on the Fellowship Project

Since the beginning of the funding period, the STEP-T1D Study has achieved significant progress across ethical, institutional, operational, methodological, technological, and academic domains. The main achievements are described below.

1. Ethical approval and protocol amendment

The project has received approval from the Ethics Committee of the University of Antioquia. The initial protocol approval was granted through Approval Act No. 078 dated November 28, 2024.

Subsequently, Approval Act No. 078 dated April 16, 2026, approved a protocol amendment primarily related to the data collection process and formally notified the funding of the project by the International Society for Pediatric and Adolescent Diabetes (ISPAD) and Breakthrough T1D.

The approval of this amendment enabled further progress in the operational implementation of the study and strengthened the processes for accessing, reviewing, and extracting clinical information from participating institutions.

2. Establishment of institutional partnerships

During the implementation period, partnerships were established with 11 healthcare institutions in the metropolitan area of the Aburrá Valley. These partnerships were



formalized following approval of the project by the respective institutional ethics committees and enabled the integration of institutions with different levels of complexity and models of care, including university and high-complexity hospitals, institutions belonging to the public healthcare network, and specialized centers providing diabetes care and management.

The participating institutions are:

- Hospital Pablo Tobón Uribe.
- Hospital Universitario San Vicente Fundación.
- Fundación Clínica Noel.
- Hospital General de Medellín.
- Hospital Alma Mater de Antioquia.
- Hospital Manuel Uribe Ángel.
- Hospital Marco Fidel Suárez.
- Metrosalud.
- Hospital Venancio Díaz Díaz.
- Clínica Neurum.
- Clínica ABC Diabetes.

The consolidation of this institutional network represents a fundamental achievement for the study, as it enables the integration of multiple data sources and improves the identification of individuals diagnosed with T1D within the geographic area of interest.

3. Recruitment of support personnel

To strengthen the operational, methodological, and technological capacity of the project, support personnel were recruited for the different stages of the research. The team includes:

- Three data collectors.
- One statistician.
- One data scientist and programmer.
- One junior graphic designer.

The incorporation of this personnel has strengthened the processes of data collection, management, processing, and analysis, as well as the project's communication, design, and scientific dissemination activities.



4. Progress in data collection

Visits to participating institutions and retrospective reviews of electronic medical records have been conducted, initially applying identification and eligibility criteria related to a diagnosis of type 1 diabetes mellitus.

As a result of this process, sociodemographic and clinical information has been collected for approximately 2,500 patients with a coded diagnosis of T1D identified at the participating institutions, from the date of implementation of the electronic health record system at each institution through December 31, 2025.

This phase corresponds to an initial process of identifying and consolidating potential cases. In subsequent stages, the study-specific temporal and geographic criteria will be applied, together with data cleaning, verification, and validation procedures, to establish the final study population.

5. Development of the project's visual identity and communication tools

A visual identity was developed for the project, including the design of a logo and various templates and graphic tools for institutional communication, the presentation of results, and scientific dissemination.

The establishment of a dedicated visual identity has contributed to strengthening recognition of the STEP-T1D Study and maintaining coherent and consistent communication across its various channels and dissemination products.

6. Development of the project website

The official STEP-T1D Study website was developed and is available at [STEP-T1D Study – Official Website](#). The website serves as a platform for disseminating information about the project, presenting its objectives and methodology, sharing results, and acknowledging participating institutions and organizations.

The website contributes to increasing the visibility of the project, facilitating communication with researchers and collaborators, and promoting the dissemination of scientific information related to the epidemiology and management of type 1 diabetes mellitus.



7. Development of an automated algorithm for data preparation and cleaning

An automated algorithm was developed to support the preparation, standardization, integration, and cleaning of databases obtained from the participating institutions.

This tool helps optimize the identification of inconsistencies, the standardization of variables, the detection of potentially duplicate records, and the organization of information for subsequent epidemiological analyses. The development of this automated process aims to improve the reproducibility, efficiency, and quality of data management.

8. Development of automated tools for capture–recapture analysis

Progress was made in the development of automated algorithms for estimating disease burden using capture–recapture methods. These tools enable the integration of information from multiple sources, the assessment of matching patterns across sources, and the estimation of potentially unidentified cases.

As part of this process, an online tool was developed to facilitate the application of capture–recapture methods in epidemiological studies integrating multiple data sources. The tool is available at [STEP-T1D Capture–Recapture Tool](#).

This development aims to facilitate the reproducible application of different statistical models and optimize the estimation of T1D incidence and prevalence while incorporating uncertainty associated with unobserved cases. The tool may also be useful for future epidemiological studies requiring the integration and analysis of multiple data sources.

In accordance with the principles of open science and scientific reproducibility, the programming code and algorithms developed as part of the project will be made available in a public GitHub repository once its configuration and publication have been completed.

9. Presentation and dissemination of preliminary results

The project's progress and preliminary results have been prepared for presentation at national and international scientific conferences. These activities include the presentation and submission of preliminary results to international conferences related to diabetes and epidemiology, including the Scientific Meeting of the American Diabetes Association (ADA 2026) and the Congress of the International Society for Pediatric and Adolescent Diabetes (ISPAD 2026).



These activities have enabled the project's initial findings to be presented for discussion within the international scientific community and have strengthened the visibility of the study and epidemiological research on T1D conducted in Colombia.

10. Training of students and researchers within the project

The project has contributed to the training of students and early-career researchers through their participation in activities involving the collection, management, analysis, and interpretation of epidemiological data.

Students from different health-related fields, as well as doctoral students, have participated in this process. Their involvement has strengthened their competencies in epidemiological research, database management, medical record review, data analysis, and the application of advanced research methods in public health.

Thus, the STEP-T1D Study not only seeks to generate evidence on the epidemiology of T1D but also contributes to strengthening capacity for epidemiological research and chronic disease surveillance in Colombia.

11. Research internship and academic exchange

As part of the fellowship period, a six-month research internship was completed from December 2025 to May 2026 at the Department of Preventive Medicine and Public Health of the Faculty of Medicine of the University of Seville, Spain.

During this period, the project received academic feedback and methodological guidance from researchers with expertise in epidemiology and public health. The internship contributed to the refinement of the STEP-T1D Study, particularly in relation to the epidemiological analysis of diabetes, the methodological development of the project, and the interpretation of epidemiological findings.

In addition, an academic exchange visit was conducted at the National Center for Epidemiology of the Carlos III Health Institute in Madrid, Spain. During this visit, the STEP-T1D Study was discussed with researchers in epidemiology and public health, providing valuable feedback on the study's methodological framework and potential approaches for strengthening epidemiological surveillance and research on type 1 diabetes.

The project was also discussed with members of the European Diabetes Epidemiology Group (EDEG) during its 2026 scientific meeting held in Sopron, Hungary. This informal



academic exchange provided an opportunity to discuss the objectives, methodological approach, and preliminary progress of the STEP-T1D Study with researchers from the international diabetes epidemiology community and to receive additional feedback for the ongoing development of the project.

Overall, these academic exchange activities strengthened the scientific and methodological foundations of the STEP-T1D Study, expanded international research collaborations, and contributed to the development of its epidemiological and analytical components.

3. Next Steps

The next phase of the STEP-T1D Study will focus on completing data collection and validation, finalizing the analytical processes, translating the findings into accessible digital and scientific products, and strengthening the dissemination and potential policy impact of the project. The next main steps are as follows:

1. Completion of data collection, data cleaning, and data auditing

Complete the collection of clinical and sociodemographic information from the participating institutions, followed by comprehensive data cleaning, verification, validation, and auditing procedures.

This phase will include the application of the final temporal, geographic, and clinical eligibility criteria, assessment of data completeness and consistency, identification and resolution of potential duplicate records, and verification of the quality and integrity of the information included in the final analytical databases.

2. Completion of data analysis and development of automated analytical algorithms

Finalize the statistical and epidemiological analyses of the study, including the estimation of the T1D epidemiological profile and the analysis of temporal and spatial patterns.

The final analyses will incorporate capture-recapture methods and advanced temporal and spatial epidemiological approaches. In parallel, the automated algorithms developed during the project will be finalized, validated, documented, and prepared for reproducible use and future dissemination.

3. Development of a digital results platform



Develop a digital platform or interactive results dashboard integrated into the official STEP-T1D website. The platform will present selected study findings using aggregated and anonymized data, ensuring the protection of individual privacy and compliance with applicable ethical and data protection requirements.

The platform will be designed to facilitate access to key epidemiological indicators and findings, including relevant temporal and geographic patterns, and to make the results more accessible to researchers, healthcare professionals, policymakers, institutions, and other stakeholders.

4. Manuscript submission and dissemination of results

Prepare and submit one or more manuscripts reporting the main findings of the STEP-T1D Study to peer-reviewed scientific journals.

In addition, the results will be presented at relevant national and international scientific conferences and meetings, providing opportunities for scientific discussion, knowledge exchange, and engagement with the international diabetes and epidemiological research communities.

5. Development and implementation of a knowledge translation and dissemination strategy

Develop and implement a comprehensive dissemination strategy to translate the study findings into accessible products for different audiences.

Planned outputs may include:

- Policy briefs for policymakers and public health decision-makers.
- Executive reports summarizing the main findings and recommendations.
- Booklets, brochures, and other educational and communication materials.
- Digital content for the project website and other communication channels.
- The digital results platform described above.

These activities will aim to facilitate the translation of epidemiological evidence into knowledge that can support surveillance, healthcare planning, resource allocation, and the development of strategies to improve the prevention, monitoring, and management of T1D in Colombia.



4. References

1. Katsarou A, Gudbjörnsdóttir S, Rawshani A, Dabelea D, Bonifacio E, Anderson BJ, et al. Type 1 diabetes mellitus. *Nat Rev Dis Prim* [Internet]. 2017; 3:1–18. Available from: <http://dx.doi.org/10.1038/nrdp.2017.16>.
2. Patterson CC, Harjutsalo V, Rosenbauer J, Neu A, Cinek O, Skrivarhaug T, et al. Trends and cyclical variation in the incidence of childhood type 1 diabetes in 26 European centres in the 25 year period 1989–2013: a multicentre prospective registration study. *Diabetology*. 2019; 62(3):408–17.
3. Tampe I, Garfias C, Borzutzky A, Slaibe L, García H. Incidence of type 1 diabetes in Chilean children between 2006 and 2021: significant increase during the COVID-19 pandemic. *Acta Diabetol* [Internet]. 2024; 61(1):29–34. Available from: <https://doi.org/10.1007/s00592-023-02163-3>.
4. The DIAMOND Project Group. Incidence and trends of childhood Type 1 diabetes worldwide 1990–1999. *Diabet Med*. 2006; 23(8):857–66.
5. Lawrence JM, Divers J, Isom S, Saydah S, Imperatore G, Pihoker C, et al. Trends in Prevalence of Type 1 and Type 2 Diabetes in Children and Adolescents in the US, 2001–2017. *JAMA*. 2021; 326(8):717–27.
6. Gregory GA, Robinson TIG, Linklater SE, Wang F, Colagiuri S, de Beaufort C, et al. Global incidence, prevalence, and mortality of type 1 diabetes in 2021 with projection to 2040: a modelling study. *Lancet Endocrinol Diabetes*. 2022; 10(10):741–60.
7. Gong B, Yang W, Xing Y, Lai Y, Shan Z. Global, regional, and national burden of type 1 diabetes in adolescents and young adults. *Pediatr Res*. 2024; (November 2023).