

## INFODENGUE PATHFINDER PROTOCOL

### **A MIXED-METHODS ACTION RESEARCH ADD-ON STUDY TO DETERMINE OPTIMUM PROCESSES, STEPS AND MECHANISMS IN HEALTH RESEARCH**

VERSION	1.0
DATE	December, 30th, 2024

**Sara de Souza Oliveira, Cláudia Torres Codeço, Laís Martins Costa Araujo, Flávia Thedim Costa Bueno, Ernesto Raul Caffarena and Larissa Pruner Marques**

**Oswaldo Cruz Foundation, Rio de Janeiro, Brazil**

Funded by the Wellcome Trust (Grant 226688/Z/22/Z)

#### **SUMMARY**

Health research requires a robust ecosystem to generate safe and effective evidence. However, challenges such as unequal access to data science, methodological difficulties and limitations in the extraction of evidence hinder significant advances. This document describes how the Pathfinder study seeks to map and document these challenges of the InfoDengue host study, identifying solutions and promoting their implementation. The study will use the Tracker tool to map InfoDengue processes and challenges, focusing on the categories "Data Management and Access", "Outcomes and Impacts" and "Stakeholder Engagement". The mapping will involve qualitative research using techniques such as document analysis, participant observation, interviews and roundtable discussions. The team will be made up of researchers from InfoDengue and Fiocruz/TGHN LAC. The study will take place over 10 months, with activities such as formulating the protocol, completing the Tracker, holding seminars and disseminating the results, strengthening research capacity and generating evidence in public health.

#### **BACKGROUND AND RATIONALE**

Every health challenge needs a research ecosystem that provides safe and effective required evidence and response. To many health challenges generating vital evidence requires better data science to be taken up across the globe and in every care setting. However, there is great inequality in (i) where data science takes place, (ii) who benefits from the evidence and (iii) who leads these studies. There is wide recognition that extracting evidence from data is not optimally undertaken in many settings or by specific groups of healthcare professionals because they deem this to be complex, difficult or because they lack access to methods, training and an understanding of the processes. These difficulties inhibit from either undertaking new research, asking new questions or failure to get proper results from existing datasets.

It is well documented that there are common areas of difficulty in health research, such as in data collection, capture, discoverability, access, sharing, analysis, scientific dissemination, but there has been little focus on understanding areas of common difficulty or sharing solutions. The rationale for these 'add-on' studies is that if various research teams, across different disease areas and research types

undertake methodology research to track and map the process, then collectively we can determine where there are common process and methods roadblocks. Where we identify areas of difficulty in these 'pathfinder' studies, it is likely that another team working in another disease area or on the same disease, but in a different location or organisation, will have already solved that same methodology step or process. Therefore, within this mixed-method action research add-on study, we will be working through The Global Health Network Latin America and the Caribbean ([TGHN LAC](#)) and TGHN's regional communities of practice to identify solutions and support these research teams to adapt and implement these for their studies. If there we cannot find a solution, we will work with the teams to solve this methodology step and report these solutions within this process mapping study.

## GOALS AND OBJECTIVES

This add-on study aims to track the steps and processes of the 'host' study InfoDengue to determine the challenges and successes encountered in generating health research evidence.

Objective 1: To generate a process map of the host study to document the selected steps and their associated metrics.

Objective 2: To determine the tools, methods, approaches and systems that have been applied to each step.

Objective 3: To describe each challenge encountered and document how they were resolved.

Objective 4: To identify new solutions to the problems mapped out during the process.

Objective 5: To disseminate the findings and support other studies in addressing similar challenges and overcoming research bottlenecks.

## METHODOLOGY

### 1. Host Study Selection

Large-scale health research requires significant amounts of intellectual, economic, social, political and scientific resources. Given the complexity of conducting them, as well as the various work fronts involved, certain processes are often inserted into work routines almost automatically, without taking into account their importance in the reproducibility of the study, a characteristic that amplifies the methodological character of the investigation.

In this sense, the implementation of a process mapping methodology can be fundamental. Not only does it facilitate the study's internal organisation, but it also strengthens the health data infrastructure and governance, allowing for greater access, reuse and sharing of data between institutions. This practice is in line with the objectives of the Pathfinder studies, which seek to accelerate health research and the data cycle, promoting the generation of new insights and evidence<sup>1</sup>.

[InfoDengue](#) is an arbovirus risk alert system that works through the integrated and timely analysis of climatic and epidemiological data. Started in 2014 as a partnership between Fiocruz's Scientific Computing Programme and the Getúlio Vargas Foundation's School of Applied Mathematics, in

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<sup>1</sup>TGHN. Global Health Data Science. About Pathfinder Studies. 2023. Available at: <https://globalhealthdatascience.tghn.org/pathfinder-projects/about-pathfinder-studies/>

collaboration with Rio de Janeiro's Municipal Health Department, the Dengue Observatory/UFGM, and researchers from the Federal University of Paraná and the State University of Western Paraná, the initiative soon spread to other partner municipalities and states, until in 2021 it began monitoring all Brazilian municipalities, under the support of the Ministry of Health.

The system operates in Brazil on a municipal, state and national scale, generating weekly arbovirus risk reports, with analyses and predictive models for dengue and chikungunya. In addition, the study's research group meets epidemiological analysis demands from the Ministry of Health, responds to requests from the news media, produces scientific articles, organises courses and seminars, sprints and congresses.

A study of this scale can benefit from a process mapping methodology, since this Pathfinder methodology, in an international context, allows not only for documentation, but also for mapping and identifying points for improvement. The study also makes it possible to expand the dissemination and use of the tools produced by the project as well as the exchange of experiences, ideas and connections with other research organisations through the integrated research network of TGHN LAC and [HUB Fiocruz](#).

## 2. Operational Delivery

The Pathfinder study is an opportunity to develop research and career skills. At the organisation where the host study is carried out, Fiocruz, a team will be formed to develop the Pathfinder study. To implement this partnership, key players will be defined who will actively contribute to the planning, execution, monitoring and evaluation of the demands of the Pathfinder study together with the InfoDengue host study.

The Pathfinder team will be made up of researchers from InfoDengue and TGHN LAC, an integration that provides complementarity of knowledge, enhancing the work to be carried out. InfoDengue will be coordinated by Dr Cláudia Torres Codeço, a researcher at the Oswaldo Cruz Foundation's Scientific Computing Programme (PROCC/Fiocruz) and InfoDengue coordinator, and the operational development of the activities will be carried out by epidemiologist MSc Sara de Souza Oliveira, who has been working at InfoDengue for 8 years. The TGHN LAC Fiocruz team will be coordinated by Dr Larissa Pruner Marques, data coordinator, with the participation of MSc Lais Martins Costa Araujo, associate researcher, and Dr Flávia Bueno, executive coordinator.

The Pathfinder team will be in charge of preparing and executing the demands defined in this document, relying occasionally on the collaboration of the InfoDengue work team for consultancy during the mapping process and definitions regarding the tools to be developed during the partnership.

## 3. Mapping the process

The Pathfinder methodology's mapping tool - Tracker - will be used to capture and document details about each step, including events, challenges and solutions, as well as the InfoDengue people involved.

For InfoDengue, given the objectives pursued with the application of the Pathfinder methodology, the mapping will focus mainly on the Tracker categories "*Data Management and Access*", "*Outputs and Impacts*" and "*Stakeholder engagement*". These categories were chosen because they are the most aligned with the objectives outlined for the partnership. Mapping these categories will provide

us with the information we need to objectively describe the crucial steps of the process and proceed to the partnership's objectives, armed with the necessary data. However, if necessary, other Tracker categories can be accessed and filled in, ensuring flexibility and comprehensiveness in the collection of information throughout the mapping.

#### 4. Gaining qualitative evidence to understand the steps, processes and challenges

The mapping process will begin with the preparation of a [Planning Matrix](#) that will guide the next steps, defining initial key points such as the actors involved, the reason for the Pathfinder to be developed, what products are expected and how the success will be measured. This matrix will be filled in by the researcher responsible for the operational integration between the host study and the Pathfinder, after discussion with the host study team, including the lead researcher (Figure 1).

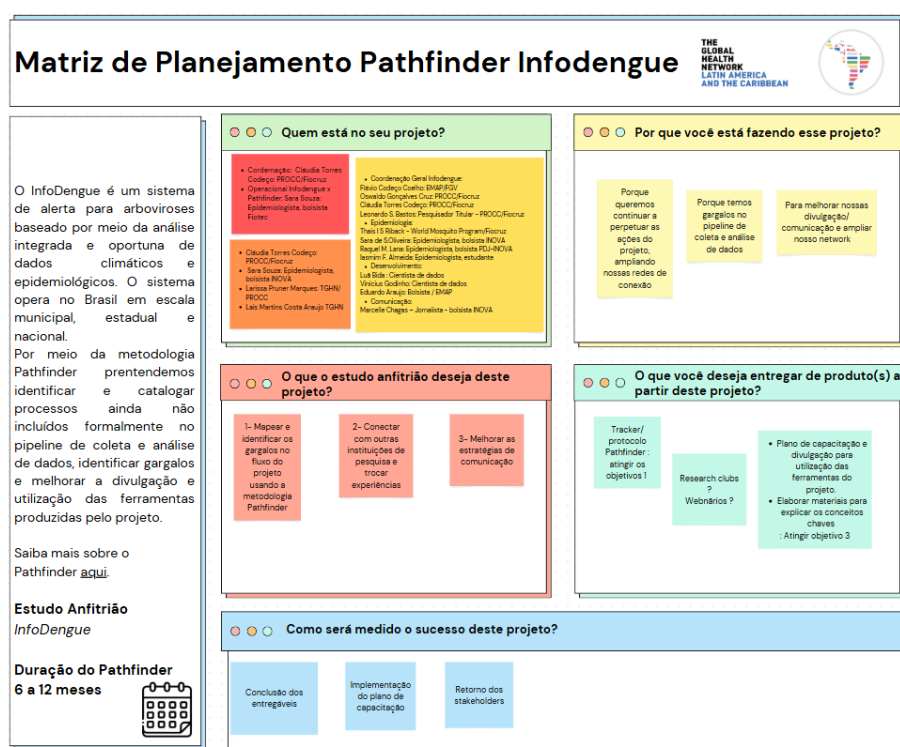


Figure 1 - InfoDenque Planning matrix for Pathfinder, in Portuguese.

Once these points have been defined, the next step is to formulate these work proposals in writing through this protocol, and to define the Pathfinder delivery schedule. Once the protocol has been drawn up, the next step is to fill in the methodology's mapping tool - the Tracker. To this end, techniques for producing data in qualitative research will be used, such as document analysis, participant observation, interviews and roundtable discussions. The combination of these techniques will help to build a more complete mapping, taking into account the different steps involved in the construction of the project, as well as different points of view in relation to this construction, broadening the understanding of important points about the continuity and reproducibility of the project.

Qualitative research is an effective methodological approach for mapping Pathfinder studies, as it allows for a better understanding of the processes and challenges faced by host studies. By focusing on meanings, contexts and experiences, it makes it possible to identify specific obstacles and solutions for each step of the study. The triangulation of techniques, such as participant observation,

document analysis, semi-structured interviews and roundtable discussions, enriches data collection by incorporating multiple perspectives. This combination strengthens the validity and reliability of the results, providing a more comprehensive and detailed view of the host studies mapped by Pathfinder. Access additional information on the [use of qualitative research for Pathfinder studies](#).

## 5. Documentation of tools, processes, methods, training

The InfoDengue System uses storage, consultation and discussion repositories to record the productions of the group participating in the research. These repositories have different formats and functions, depending on their purpose, and could be used to store the outputs of the partnership with Pathfinder.

"GitHub" is the platform used for collaborative development, storage and sharing of tools building analysis *scripts*, solving challenges and dealing with problems related to data analysis.

"Discord" is the asynchronous communication tool used by the project team to send questions, warnings, discussions and updates at times other than fixed meetings. This tool allows work to be divided into different discussion groups on the same server, depending on the subject.

The InfoDengue system website and the project's consultation A.P.I. are also used as data and report repositories. The links to these repositories can be found below:

- GitHub InfoDengue: <https://github.com/AlertaDengue>
- InfoDengue system website: <https://info.dengue.mat.br>
- InfoDengue A.P.I.: <https://info.dengue.mat.br/services/api>

## 6. Solving challenges and connecting excellence

Among the objectives of action research, the Pathfinder team can act to find solutions to the challenges encountered by the host study during the mapping. This can involve looking for specialised training, models, software, data science infrastructure, as well as documents and guidelines related to data sharing agreements, among others. Solutions can be found within the Pathfinder team itself, in the TGHN community or through other strategic partners.

## DATA ANALYSIS

### 1. Generation of the study-specific process map diagram with metrics

The process map will be recorded using the [Tracker tool](#), developed for the Pathfinder methodology. The structure of the tool makes it possible to detail various aspects of the process, including time consumption, staff allocation, resources employed, output generated, as well as lessons learnt, and challenges encountered at each step of the process.

### 2. Qualitative analysis

The process mapping steps will be carried out using qualitative research tools. As already mentioned, qualitative research stands out as an approach capable of contributing to the mapping of Pathfinder studies, as it makes it possible to uncover the more complex and contextual details of the challenges faced, as well as the solutions and lessons learnt during the process of executing the host study at each of its steps. By emphasising meanings and experiences, qualitative research offers tools to explore barriers and propose solutions tailored to the specific needs of each scenario. By

integrating different techniques, such as participant observation, document analysis, semi-structured interviews and roundtable discussions, it is possible to capture multiple perspectives. This combination of techniques, also known as triangulation, not only increases the reliability of the information, but also allows for a more complete understanding of the phenomena under study, enriching the analysis and enhancing the results.

Therefore, in order to obtain as much information as possible to fill out the Tracker tool, Pathfinder InfoDengue will adopt techniques such as participant observation, in which the researcher actively participates in the environment or group being studied, observing and recording behaviour, interactions and cultural practices. The field diary will be the main working tool in this approach. Documentary analysis will also be carried out, which will include going through the field diary of the researcher working on the host study and Pathfinder, as well as study protocols, research projects, published articles, notes and other documents and repositories from the host study. To complement the data obtained through documentary analysis, roundtable discussion and/or interviews will be held with focal actors, using semi-structured scripts. In particular, interviews will be essential to fill in gaps left by documents and observation. They are essential tools for retrieving information that is often concentrated in individuals, but which is crucial for understanding the processes and contexts of the collective.

The process of analysing and processing the material produced during the qualitative research will be carried out using a systematic and interactive approach. Once the data has been collected, it will be organised by recording and transcribing the roundtable discussions and/or interviews and sorting the information obtained. Finally, the data will be classified and categorised, identifying relevant patterns, themes and categories that emerge from the content and answer the Tracker's gaps.

## INTERPRETATION AND USE OF FINDINGS

The interpretation and use of the findings generated during the mapping and unfolding of the Pathfinder project are key to ensuring that the results are applied effectively and can benefit both the host study and other projects. To this end, the Pathfinder team will hold weekly interactions to align strategies, define directions and plan activities, as well as supporting the execution of various actions, such as webinars, writing proposals for calls, organising events and joint projects.

Collaboration between those involved goes beyond strategic alignment, promoting the creation and ongoing sharing of tools. If specific tools are produced for any step of the project, they will be shared with other Pathfinder projects and partners. This initiative aims to contribute to the continuous improvement of projects as a whole, promoting synergy and collaborative innovation. The process of sharing the information produced will be made possible through a folder shared by both teams (InfoDengue and Pathfinder).

In addition, the project's progress will be constantly presented to the other Pathfinder projects in Latin America and the Caribbean during the [Pathfinder Clinic TGHN LAC](#) sessions. This exchange of information is essential to ensure that the experiences and lessons learnt from each study contribute to the improvement of ongoing research actions.

The tools and products created during the partnership will be actively used in the host study, both to provide the team with a systematised overview of the processes developed within the study, and in the execution of practical tasks related to the group's work. Among the products to be developed are the



completed Tracker tool, webinars on topics relevant to the host study, production of a thematic glossary with the most commonly used technical terms in the InfoDengue project's publications and products, the Pathfinder Brief, a list of stakeholders and key players active in the project and publications such as *comments* or articles. The Pathfinder partnership will also enable technical support for the development of the InfoDengue training plan and support for activities related to the symposium to be held by the host study group (e-Vigilância). In addition, Research Clubs and scientific dissemination webinars can be developed, organised by TGHN LAC in partnership with the InfoDengue research group.

In addition to enabling the structuring of the host project's framework through its methodology, Pathfinder also provides the host study with structured support for the development of actions and products. These will help not only to create solutions for the identified challenges but also to expand the communication network and disseminate the study's outputs, fostering new partnerships and increasing visibility through TGHN LAC's international network.

## ETHICAL CONSIDERATION

Pathfinder mapping can be understood as a methodological and procedural self-analysis, with the aim of reporting on activities and having insights into the conduct of the host study by the team itself. No participant identification information will be shared, and the datasets will be kept locally by the host study team.

Before the activities begin, a presentation of the Pathfinder project and the Tracker tool will be given to contextualise the scope of the mapping. This will ensure that all participants understand the tools and objectives, while also respecting the option of not participating in the host study's mapping.

## COMMUNICATION AND DISSEMINATION OF THE FINDINGS

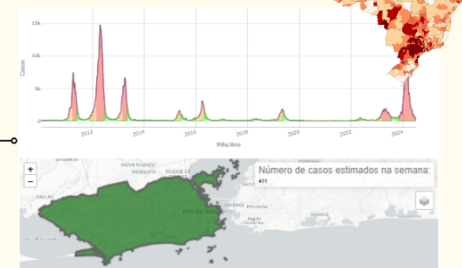
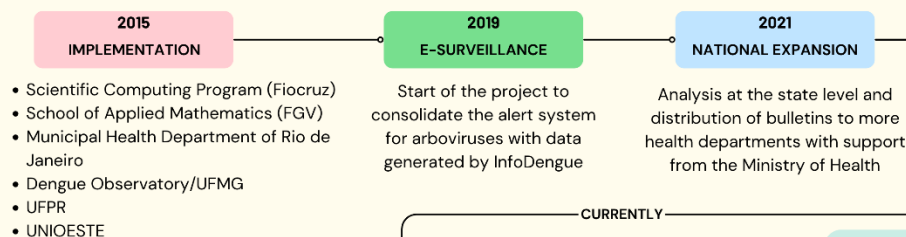
The mapping carried out, as well as the content produced by the team during the Pathfinder, will be shared among the members of the host study, PROCC and Fiocruz researchers, but also with other TGHN knowledge hubs and TGHN LAC partners. This strategy aims to stimulate the exchange of experiences with other research institutions, especially those involved in Pathfinder projects, promoting a collaborative and mutual learning environment.

In addition, the aim is to disseminate the results and lessons learnt at scientific events related to the topic, broadening the reach and impact of the experience. It should be noted that as new suggestions and improvements are made, the content can be updated, ensuring relevance and suitability to the needs identified.

All the productions from [Pathfinder InfoDengue](https://lac.tghn.org/proyectos-pathfinder/pathfinder-brasil/infodengue/) will be gathered on the TGHN LAC website (<https://lac.tghn.org/proyectos-pathfinder/pathfinder-brasil/infodengue/>). The resources, depending on the profile, will be made available in two or three languages (Portuguese, English and/or Spanish), hosted on the TGHN LAC platform, and on Fiocruz institutional platforms, such as educational resources on [Educare](#), courses on the [Fiocruz Virtual Campus](#) and materials on [Arca](#). This approach ensures broad access to the results, promoting the dissemination of knowledge and strengthening the network of researchers and partner institutions. The retrospective systematisation and synthesis of the steps of the host study and Pathfinder can be seen in the infographic, as shown in Figure 2.

### INFODENGUE PATHFINDER PROJECT

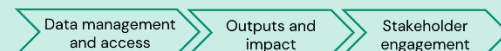
Process mapping on InfoDengue investigating new solutions to generate useful information for management and for advancing knowledge of arboviruses and their control



Fluxo InfoDengue				
<b>DATA COLLECT</b>	Cases of arboviruses SINAN-MS data	Arboviruses: Dengue, Zika, Chikungunya Weather data: Weather Underground data	Parameters: temperature and humidity	Demographic data IBGE data
<b>HARMONIZATION AND DATA ANALYSIS</b>	Notification delay fix (Nowcasting) Bastos et al. (2019)	Sustained Transmission Detection Codeço et al. (2018)	Receptivity analysis	Atypical situation detection
<b>GENERATION OF INDICATORS AND REPORTS</b>	Weekly reports	EpiScanner	E-learning course	Situation rooms
<b>COLLABORATION AND INNOVATION</b>	Collaborator network	Github repository	<b>CHALLENGES AND SOLUTIONS</b>	Technical and scientific challenges

### PATHFINDER

Process mapping - stages of the host study



Overall objective

To track the steps and processes of the InfoDengue to determine the challenges and successes encountered in generating health research evidence.

Deliveries to date

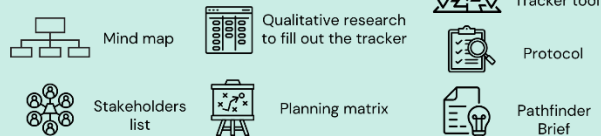


Figure 2 - Infographic summarising the InfoDengue and Pathfinder study.

## PROJECT TIMELINE

The initial Pathfinder timetable was structured for a period of 10 months, which can be reassessed as necessary (Chart 1).

- August - September/24 - Planning matrix
- November/24 - Final version of the Pathfinder protocol and v.1 tracker (document analysis)
- November/24 - InfoDengue and InfoGripe presentation at the Pathfinder Clinic TGHN LAC session
- December/24 - Roundtable discussions and interviews
- January/25 - Analysis of qualitative data and v.2 of tracker
- August 2024 - June 25 - Deliverables:
  - Planning matrix: Sept 2024
  - Webinars: Oct/24 and according to assessment
  - InfoDengue Pathfinder Protocol: Nov/2024
  - Presentation of the proposal at the TGHN LAC Pathfinder Clinic Session: Nov/2024
  - Complete Tracker Tool: Jan/2025
  - Thematic glossary: Apr/2025
  - Pathfinder Brief: Jun/2025
  - Testimonials related to the impact of Pathfinder and deliverables for the host study team: Jun/2025
- Weekly meetings on Thursdays.
- Monthly meetings of the TGHN LAC group at Pathfinder Clinic sessions.



Table 1. Initial schedule proposed for Pathfinder InfoDegue.

Activities	JUL (2024)	AUG (2024)	SEPT (2024)	OCT (2024)	NOV (2024)	DEC (2024)	JAN (2025)	FEB (2025)	MAR (2024)	APR (2025)	MAY (2025)	JUN (2025)
Map summarising the studies (mind map)												
Planning matrix												
Ideas Workshop Team												
Protocol												
Tracker												
Monthly meetings TGHN LAC												
Weekly meetings												
Deliverables												

## FINAL REMARKS

A protocol serves to guide and standardise all the steps of the study, ensuring that the proposed objectives are achieved in a systematic and consistent manner. In the context of this study, the protocol was produced based on the mapping interests of the InfoDengue host study, making it possible to identify obstacles in the research and health data cycle. The results of the InfoDengue Pathfinder will be shared as they become available, contributing to the improvement and resolution of challenges in the field of public health.